IN THIS ISSUE—MANY ADVANTAGES IN FACTORY "UNIT SYSTEM"

The Automobile

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Stewart PRODUCTS

Sell Motorists What They Want

That's the easiest way to increase your sales. Let the easy-to-sell lines earn profits for you. That is how successful dealers operate.

They don't waste time trying to push unknown, unadvertised goods that motorists know nothing about.

Concentrate on one line—Stewart Products. And sell the entire line. Don't make the mistake of selecting one or two Stewart Products. Sell all of them—the Speedometer, Warning Signal, Tire Pump, Vacuum System, V-Ray Spark Plug, etc.

Motorists are sold on the full line of Stewart Products. Then, why shouldn't you cash in on the demand by selling the entire line?

Stewart Products is a growing line. New products are being added. Watch for two new whirlwind sellers to be announced in a few weeks.

Tie up with the growing, fast-selling, easy-to-sell line of Stewart Products.

"It will pay you to see that every car is Stewart-equipped."

Stewart-Warner Speedometer Corporation
Chicago, U. S. A.

$6
Stewart Motor Driven Warning Signals

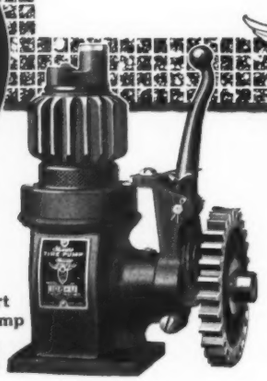
$3.50
Stewart Hand Operated Warning Signal

$10
Stewart Vacuum System

$1
Stewart V-Ray Spark Plug

Warner Auto-Meter $50

Stewart Speedometer $25



Stewart Tire Pump
$12

Stewart Instrument Board for Ford Cars Complete
$11.25

The AUTOMOBILE

VOL. XXXVI NEW YORK—THURSDAY, MARCH 29, 1917—CHICAGO NO. 13

S. A. E. To Change Name April 19

Step Will Facilitate Co-operation with U. S. Government in Standardization Work

NEW YORK, March 27—In order to further standardization work in connection with government preparedness work, the Society of Automobile Engineers will change its name April 19 to Society of Automotive Engineers At that time the engineers who were formerly members of the American Society of Aeronautic Engineers, the Society of Tractor Engineers and engineers connected with the company members of the National Assn. of Engine and Boat Manufacturers will be working together with those who have been members of the Society of Automobile Engineers, always with the welfare of the nation at this time held constantly in view. The culminating decision to change the name was based on government co-operation in time of stress.

The Preparedness Committee of the S. A. E., consisting of President G. W. Dunham, past President W. H. Vandervoort and Vice-President J. G. Vincent, is not only making a classification of the society members with reference to qualification to co-operate with the government and keeping in close touch with various government officials, but is taking an active part in the big plan under way to increase the membership, drawing upon engineers in the various automotive fields.

Fageol Refuses Orders—U. S. Needs Its Aero Engines

OAKLAND, CAL., March 24—The Hall-Scott Motor Car Co., maker of Hall-Scott Aviation Motors, which is being used in the new Fageol car, has received an urgent request from the War Department of the United States Government to use every effort to furnish all available aviation motors for the next 6 months. The Fageol Motor Co. has agreed to allow the Hall-Scott Motor Co. to use its allotment of motors for this period to help in filling the demands of the government. Consequently, the Fageol Motor Co. will accept no further orders for cars until the present needs of the War Department have been filled and motors can again be secured from the Hall-Scott Motor Car Co.

S. A. E. Summer Meeting Date Withheld

NEW YORK, March 26—The Society of Automobile Engineers has decided to withhold any announcement of the time and place of the summer meeting, pending development of international conditions, with the thought that in the event of untoward results in this respect the Society shall be as untrammeled as possible with plans interfering in any way with direct work for the nation.

Packard Has 78 Per Cent Increase

DETROIT, March 23—The Packard carriage sales board in its meeting reported to the Packard Motor Car Co. that it had an increase in business, from Feb. 15 to March 15, of 78 per cent over the same period in 1916. The board is composed of the sales managers of the Packard branches and dealers, established in nine of the principal cities of the country.

WAR-TIME ROAD BUILDING

W. F. Bradley, special correspondent of THE AUTOMOBILE *with the allied armies, will tell next week how the Italians have built magnificent roads over the Alps as an aid to the campaign against Austria. The roads have been in building during the months Bradley has spent on the Italian front. They are not temporary but of the most permanent sort and cover some of the most difficult country in the world.*

No 1917 Races at Indianapolis

Track Plant for War Work—To Sell Cars—Other Speedways Not Affected

CHICAGO, March 26—The decision of the Indianapolis speedway not to hold any automobile races this year, to call off its Decoration Day 500-mile race scheduled for May 30, as announced by James A. Allison, means that the strongest supporter of racing in the country is out of the sport for this year and perhaps longer in case war continues. The Indianapolis speedway has called off its entire racing program solely because its owners do not believe that there should be professional sport, such as racing, with the country in a state of war. Mr. Allison believes in amateur sports during war time but not professional sport.

While the Indianapolis speedway has declared itself out of racing this year, it is not going to place any barrier in the way of other speedways, and as a result its team of racing cars is for sale. The Prest-O-Lite racing team, owned by Mr. Allison, consists of two Peugeots and three Premier cars. All are for sale with the exception of John Aitken's Peugeot, which is being locked up for the year.

Drivers Are Free

The racing drivers of the Indianapolis team are free to make whatever arrangements they may want to.

The racing factory, built near the speedway, in which Mr. Allison was going to build racing cars and parts, and which factory measuring 140 by 80 ft. is well fitted with lathes, milling machines, grinders and all other kinds of necessary machinery, has been offered to the government to use as it sees fit. Besides this the entire Indianapolis speedway, with its 2½-mile brick track, has been offered to the government so that it can be used as an aviation field or for any other purpose desired.

(*Continued on page* 636.)

Wire Wheel Corp. Buys Houk

Acquisition of Houk Interests Culminates Movement to Clarify Patent Situation

NEW YORK, March 24—The purchase by the Wire Wheel Corp. of America of the entire Houk wire wheel interests, covering both the George W. Houk Co. and the Houk Wire Wheel Corp., has cleared up the wire wheel situation as regards threatened patent litigation. Mr. Houk retains an active interest, becoming a vice-president of the Wire Wheel corporation.

For months past the trade and public alike have been apprehensive of the many rumors threatening litigation which would have involved practically every maker of passenger cars in the country. With the purchase of these two together with the Cowles, House and Houk patents, the entire group covers every phase of the wire wheel construction, according to advice of prominent patent attorneys. Negotiations, it is stated, are now under way with other wire wheel makers with a view to issuing licenses.

The Wire Wheel Corp. was formed with $2,000,000 capital by a syndicate in which Bertron, Griscom & Co. and Jamieson, Houston & Graham, Inc., were active. John F. Alvord, president of the Standard Co., Torrington, Conn., the Splitdorf Electrical Co. and the Hendee Mfg. Co., heads the new concern, with George W. Houk and R. E. Griscom as vice-presidents, and S. A. Fahnestock, secretary and treasurer.

The East Springfield plant of the Hendee Mfg. Co., covering 10½ acres and 175,000 ft. of manufacturing floor-space, has been acquired, and will produce wire wheels for high-priced cars and also develop wheels for low-priced cars.

To Expand Houk Plant

The Houk plant at Buffalo will be increased in capacty by 100,000 sq. ft., work on the addition starting May 1, and the production of Houk wheels will be greatly increased. The Houk output increased 300 per cent in 1916 over 1915, and in 1917 to date is running 400 per cent ahead of 1916. The executive committee of the Wire Wheel Corp. is J. F. Alvord, R. E. Graham and R. E. Griscom. Among the directors are these three, Marshall J. Dodge, of Bertron, Griscom & Co., and J. S. Bretz, Bearings Co. of America.

Underwriting of the stock of the Wire Wheel Corp. is being carried on by White, Weld & Co. and Bertron, Griscom & Co., who have purchased a large interest in both the preferred and common issues. The corporation has a capitalization of $5,000,000 of 8 per cent cumulative preferred, of which $4,000,000 is outstanding, and 100,000 shares of common of no par value. The preferred is redeemable as a whole or in part at any dividend date on 30 days' notice and accrued dividend to April 1, 1918, thereafter at 107 and accrued dividend to April 1, 1919, and thereafter at 110 and accrued dividend.

Mr. Houk returned to this country in 1912 with the Rudge-Whitworth wire wheel blue prints and succeeded in interesting Philadelphia capital in his product. Manufacture was started on a small basis in the old Standard Roller Bearing plant in that city. Notwithstanding the fact that this company went into the receivers' hands, Mr. Houk had succeeded in establishing the practicability of wire wheels, and in the fall of 1913 he organized the Houk Mfg. Co., Buffalo. The McCue axle and forgings plants were purchased and later the present Houk wire wheel was developed.

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Changes in Car and Truck Prices

Maker—Model	Former Price	New Price
Briscoe, 4-24	$625	$685
Briscoe, 4-38	785	845
Briscoe, 8-38	985	1,045
Packard Truck, 1 Ton	2,200	2,325
Packard Truck, 1½ Ton	2,500	2,600
Packard Truck, 2 Ton	2,800	3,000
Packard Truck, 3 Ton	3,400	3,600
Packard Truck, 4 Ton	3,800	4,025
Packard Truck, 5 Ton	4,300	4,550
Packard Truck, 6 Ton	4,550	4,800

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No Changes in Wheeler-Schebler Contemplated

INDIANAPOLIS, IND., March 24—Officers of the Wheeler-Schebler Carburetor Co. announced to-day that the recent action of the company in incorporating in both Indiana and Michigan with a capitalization of $1,000,000 in each state means no change in the policy of the company. The company had operated as a partnership until the incorporation papers were filed, Frank H. Wheeler of this city having been the sole owner of the concern since he bought out the Schebler interests about 3 years ago.

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Barley Sells Halladay Interest

DETROIT, March 22—A. C. Barley, president of the Barley Motor Car Co. of Halladay, Michigan, manufacturer of the Roamer car, states that he has sold all interests in the Halladay to the Halladay Motor Car Co. of Mansfield, Ohio.

KALAMAZOO, MICH., March 27—The Barley Motor Co. has been organized here with a capital of $200,000.

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Seagrave First Eight-Cylinder Truck

WALKERVILLE, ONT., March 23—The first eight-cylinder truck to be built has been brought out by W. E. Seagrave & Co., prominent in the fire apparatus field. The truck sells at $7,000 and is made in 3½-ton capacity, at present, though 2 and 5-ton sizes will also be built. Besides its eight-cylinder engine, the truck is standard in construction. The engine is a Herschell-Spillman V-type.

Quantity Production for Europe

Demand for Our Parts—Fewer Bodies To Be Shipped—U. S. Engineers in Demand

NEW YORK, March 23—Quantity production of automobiles in Europe will be in force as soon as peace is declared, is the prediction of M. S. Keller, president of the American Motors, Inc., 100 Broad Street, which recently announced a comprehensive export service to automobile makers. Export conditions will be somewhat changed, one of these being in regard to the method of shipping cars.

According to Mr. Keller, one important change will be in bodies. He believes that most of the cars shipped after the war stops will be stripped of bodies, and will go over to the other side only in the chassis. He bases this on the fact that there is such a high tariff on cars with bodies on, that the European buyer will demand only the chassis, depending on the body builder in his own country to take care of that detail. With this fact in mind, he predicts that Europe will enter extensively into the manufacture of bodies so as to take care of this demand.

American parts will enter largely into the production of European cars, according to Mr. Keller. Instead of turning out an expensive product, as heretofore, the European factories will invade the medium and low-priced fields, having in view the use of the American standardized parts, turned out in large quantities.

—

Frank Brothers Out of Lozier

DETROIT, March 28—Samuel and Harry Frank have sold their entire holdings in the Lozier Motor Co. to Theodore Friedberg and associates. They were vice-president and treasurer, respectively. Mr. Friedberg is president.

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National Tire Purchased by Syndicate

EAST PALESTINE, OHIO, March 27—The National Tire & Rubber Co. has been purchased by a syndicate of local capitalists and reorganized. The name of the company remains unchanged, the new officers being: President, C. L. Merwin; vice-president and general manager, S. L. Warner; secretary, E. N. Herrick; treasurer, R. B. Taggart. The company has plans under way to double the capacity of the plant within the next 30 days.

—

Krebs Truck in New Hands

CLYDE, OHIO, March 22—The Krebs Commercial Car Co. has been sold to Massachusetts capitalists, including C. R. Dunbar of Holyoke, C. H. Bowker of Northampton, W. P. Dodge of Springfield, G. W. Bradburn of South Lea and J. B. Crockett of New York. Louis Krebs and Harmon Baynes retain their interests.

Duesenberg Motors Refinanced

Acquires Plant at Edgewater, N. J.—J. R. Harbeck is Pres. —Duesenberg Engineer

NEW YORK, March 23—The Duesenberg Motors Corp. has succeeded the Duesenberg Motor Co., St. Paul, and the Loew-Victor Engine Co., Chicago, its capital being $1,500,000, of which $1,050,000 is paid in. The stock ownership is in the hands of prominent commercial and financial circles of this city. As stated in a recent issue of THE AUTOMOBILE, the company has located a plant in the East at Edgewater, N. J. The engineering and experimental forces have already been moved from Chicago and the company will, in a short time, be building on a commercial basis a line of Duesenberg motors for both automobiles and aeronautical purposes, devoting the output of the Chicago plant to marine models. The Loew-Victor Engine Co., has been building one of the largest high-speed marine motors on the market for the past year. These motors were designed by F. S. Duesenberg. The Chicago plant will in the near future be consolidated with the Edgewater plant.

It is the intention of the new corporation to build only motors of the highest grade and will therefore cater to automobile builders that are producing cars selling for $2,000 and up. The sales and executive offices of the company will be at 120 Broadway, this city.

The personnel of the organization is as follows: Directors, J. R. Harbeck, F. S. Wheeler, Charles Stollberg, K. S. Breckenridge, L. A. Welles and F. B. Page. The first five are all of one of America's largest industrial corporations. Mr. Page is vice-president and general manager of the E. W. Bliss Corp.

J. R. Harbeck, who was president of the Loew-Victor Engine Co. since its formation, is president and managing director of the Duesenberg corporation. E. L. Decker is assistant to the president; H. A. Wing, is secretary and treasurer; C. B. Page is general manager in charge of production and N. G. Rost is general sales manager. F. S. Duesenberg is chief engineer. A. S. Duesenberg is assistant engineer. M. M. Whitaker is assistant engineer and naval architect. G. A. Beilstein is purchasing agent and F. E. Lampe is superintendent.

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Watson Heads Lee Tire

CONSHOHOCKEN, PA., March 22—At the organization meeting of the directors of the Lee Rubber & Tire Corp. held to-day John J. Watson, Jr., who has been vice-president and treasurer of the company was elected president and A. A. Garthwaite, former president was elected vice-president and treasurer. Henry Hopkins, Jr., was re-elected secretary. The retiring directors were re-elected.

A number of questions with regard to the manufacturing end of the business and the future dividend policy were brought up at the meeting. It was stated that it was probable that no action on the part of the board of directors would be taken on the question of resuming payments on the stock until such time as the $1,000,000 debt has been wiped out and in addition a good surplus reserve built up.

The output for the year is estimated at between 350,000 and 400,000 tires, as compared with 225,000 tires in 1916.

—

Willys-Knight Staggered-Door Sedan

TOLEDO, March 26—The Willys-Overland Co. is now building a staggered-door type of convertible sedan body on its Willys-Knight Four chassis to sell at $1,950. The doors are placed so that passengers enter in the middle of the car giving unobstructed passage to seats, while the driver's door is at the front on the left side allowing him to enter or leave without interfering with others in the car. Up to this time the convertible sedans were equipped with doors on each side in the middle of the car.

Feb. Exports Drop $2,000,000

Total $6,897,086 is Smallest Since March, 1915—Submarines Potent Factor

Mos.	Cars	Value	Trucks	Value	Parts
1917					
Jan	4520	$3,044,995	1269	$3,416,818	$1,800,621
Feb.	3939	2,852,308	784	2,128,665	1,916,113
1916					
Feb.	5651	4,063,429	2063	6,170,367	2,173,409

WASHINGTON, D. C., March 28—Exports from this country during February were the lowest since March, 1915, totaling only $6,897,086, as compared with $9,569,746 in the previous month and $12,407,205 in February, 1916. Unrestricted submarine warfare, though having very little effect on March shipments, seems to have caused considerable damage to our automobile shipments in February. France, Mexico, the West Indies, Argentina, and Venezuela were the only countries which increased their purchases of our cars, trucks and parts in February. Only 3939 cars valued at $2,852,308, and 784 trucks valued at $2,128,665, were shipped last month. The shipment of parts totaled $1,916,113. For the 8 months' period, ended February, there was a decline of several millions in the value of truck exports, while on the other hand passenger cars increased over 4000 in number and $2,500,000 in value.

The recent action on the part of the British Government to divert shipments to France as much as possible is responsible for this month's increase of forty cars and trucks. Mexico has increased its purchases from ninety-six to 313.

The detailed export statistics appear in the accompanying table.

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Fay Makes $10,000,000 Contract

BOSTON, March 27—C. E. Fay has just closed a contract with the Maxwell Motor Sales Corp., involving $10,000,000, for the distribution of Maxwell cars in eastern Massachusetts and Rhode Island.

Exports of Automobiles, Trucks and Parts for February and 7 Previous Months

	February				7 Previous Months			
	1916		1917		1916		1917	
	Number	Value	Number	Value	Number	Value	Number	Value
Passenger cars	5,651	$4,063,429	3,939	$2,852,308	33,256	$25,534,507	37,470	$28,203,439
Commercial cars	2,063	6,170,367	784	2,128,665	14,467	38,729,721	10,897	30,851,637
Parts, not including engines and tires	.....	2,173,409	.....	1,916,113	.....	14,965,360	.....	15,566,330
	7,714	$12,407,205	4,723	$6,897,086	47,723	$79,229,588	48,367	$74,621,406
			BY COUNTRIES					
Denmark	27	18,468	15	16,456	469	341,905	1,111	835,445
France	1,027	2,804,931	503	1,024,102	4,199	10,798,226	4,328	12,925,101
Germany	.....	.....	.....	.....	.....	.....	.....	.....
Italy	23	18,558	4	2,281	207	146,144	77	48,430
Russia in Europe	335	1,514,729	65	177,660	4,568	14,338,776	2,285	5,896,380
United Kingdom	1,169	1,763,079	280	805,615	14,740	20,377,746	4,332	10.525,490
Other Europe	281	301,082	160	186,299	940	975,010	3,205	2,457,041
Canada	947	593,492	673	526,767	4,287	3.033,808	5,805	4,772,762
Mexico	57	70,210	313	168,085	226	238,526	829	555,663
West Indies	538	366,188	368	384,123	2,708	1,712,084	3.925	2,955,628
Argentina	380	214,325	242	125,073	2,635	1,199,860	2,809	1,645,252
Brazil	34	23,465	68	44,565	144	89,521	422	251,174
Chile	54	35,295	201	154,355	540	373,389	1,455	1,000,664
Venezuela	24	14,010	73	39,670	301	198,185	406	264,106
Other South America	78	43,236	198	110,148	332	190,070	1,126	684,408
British East Indies	230	170,158	358	323,011	1,859	1,400,491	3,699	2,738,058
Australia	598	597,661	172	127,388	4,005	3,403,917	3,481	2,544,461
Other Asia and Oceania	1,564	1,497,523	638	524,763	3,291	3,867,727	6,229	6,915,805
Other countries	348	187,386	392	240,612	2,272	1,605,933	2.843	2,039,208
Total	7,714	$10,233,796	4,723	$4,980,973	47,723	$64,291,228	48,367	$59,053,076

$1,358,810 Net for Peerless

Balance for 1916 Is Equal to 13.56% on $10,000,000 Outstanding Stock

NEW YORK, March 23—The Peerless Truck & Motor Corp. for 1916 showed net profits of $1,358,810, after allowing for the full year's interest on the $5,000,000 notes outstanding, and after charging off $550,637 as a net loss on munitions and special foreign contracts of the General Vehicle Co. Net profits in 1915 were $2,555,773.

The balance at the end of the year, Dec. 31, was $1,358,810, after deducting $2,453 for preferred dividends on the stock of the Peerless Motor Car Co. outstanding is equivalent to 13.56 per cent on the $10,000,000 capital stock, or $6.78 per share, par value $50.

Net sales of the subsidiary companies of the truck company for the calendar year 1916, excluding munitions and special foreign contracts of the General Vehicle Co., were $13,525,023, an increase of $1,234,057 over the sales of the preceding year. The balance sheet shows cash and marketable securities of $2,077,152 on hand as of Dec. 31, last.

Peerless Truck & Motor Corporation and subsidiary companies report following consolidated income account:

Net sales, excluding munitions and special contracts of General Vehicle Co.	$13,525,023
Cost of sales, plant maintenance and repairs	11,020,264
Depreciation of plants	311,554
Net income from sales	$2,193,204
Other income, including interest earned	154,233
Total income	$2,347,437
Deduct interest on notes	300,000
Interest on bonds	9,925
Premium on bonds retired	11,040
Organization expenses	15,754
Depreciation in investments	28,702
Balance	$1,982,015
Net loss on munitions and special foreign contracts, General Vehicle Co.	550,637
Special reserve for contingencies	72,566
Net profit for year	*$1,358,810

*Equal to $6.78 per share of Peerless stock, par $50.

The Peerless Truck & Motor Corporation's consolidated balance sheets, as of Dec. 31, 1916, compares as follows:

Assets	1916	1915
Plant, land, buildings, etc.	$4,891,680	$5,527,140
Patents, franchises and good will	3,710,520	5,100,000
Cash	1,503,778	2,449,773
Marketable securities	573,375	431,978
Inventories	4,628,348	2,143,015
General Vehicle Co. investment	93,997	.....
Sundry debtors	38,157	29,463
Accounts and notes receivable	1,101,802	539,515
Cash for purchase Peerless M. stock	29,190	.....
Prepaid expenses	50,190	265,968
Total	$16,621,038	$15,537,734
Liabilities		
Capital	*$4,898,110	.....
Peerless Motor Car Co. pfd. stock	27,800	$2,100,700
Peerless Motor Car Co. com. stock	.....	2,085,500
General Vehicle Co. pfd. stock	.....	1,200,000
General Vehicle Co. com. stock	.....	5,000,000
Funded debt	5,290,000	900,000
Accounts payable	1,412,241	1,012,308
Special deposits	160,800	200,700
Documentary drafts discounted	252,495	.....
Sundry creditors and reserves	501,365	177,074
Contingency reserve	653,845	.....
Preferred dividend	.....	1,505
Subsidiary co. liab. to Peerless Co.	.....	135,743
Surplus	3,424,381	2,274,734
Total	$16,621,038	$15,537,734

*Capital represents consideration received in cash for the following capital stock issued as full paid and non-assessable in terms of financial plans, filed in accordance with the statutes of Virginia: Capital stock authorized, $20,000,000; capital stock issued and outstanding, $10,000,000. Par value of stock is $50 a share.

Britain Wants More Ford Tractors

DEARBORN, MICH., March 28, *Special Telegram*—Henry Ford & Son have received the following telegram from their London, England, office:

"We are able to plow and cut up grass lands for all autumn harvest. Please send all tractors possible available, also two and three-furrow plows and plenty of shares for both tractor and plows. Two first tractors working with complete satisfaction 24 hr. a day Everyone enthusiastic, everything satisfactory as possible. Cork awaiting details on material from America. Cable when you can send tractors."

The Ford company is getting ten or twelve tractors ready and will send them as quickly as possible.

Reports have been current that the English tractor makers have protested that the Ford privileges in Britain were such as to render the business almost a monopoly.

Detroit S. A. E. Gains Members

DETROIT, March 23—The Detroit section of the Society of Automobile Engineers now has 960 members and expects to reach the 1000 mark by the end of the week. The membership of the parent society is now 2262 and it is proposed to increase this by 1000 during April.

Mid-West to Talk Fuels April 14

CHICAGO, March 26—Present day automobile fuels and how they can best be handled will be the subject of the symposium at the next meeting of the Mid-West Section, S. A. E., at the Chicago Automobile Club April 14. Information on available fuels for the next few years will be given by Dr. Burton, vice-president Standard Oil Co. of Indiana. Discussion on the carbureter man's problem will be led by F. C. Mock, chief engineer of the Stromberg company, and the engine designs for using these fuels will be discussed by H. L. Horning, general manager, Waukesha Motor Co.

Will Revive U. S. Radiator Plant

DETROIT, March 22—The United States Radiator Corp., is preparing to resume manufacturing operations in its Detroit plant. It has been closed for the last 5 years. The plant will give employment to 500 men and will be opened at capacity.

Crankshaft Corp. Prosperous

Earns $18.33 a Share on Common—$7 Dividend on Common—Will Double Output

DETROIT, March 26—The Automobile Crankshaft Corp. has declared a second dividend at the rate of $7 a share on the company's 7500 shares of common stock and a second dividend on the 2500 shares of 7 per cent cumulative preferred stock.

The Crankshaft company has listed 7500 shares of its common stock on the Detroit exchange at $77.50 per share. The stock has no fixed par value and the present price is based on the estimated earnings of $225,000 during 1916.

The company numbers among its customers some twenty-five automobile makers, including the Cadillac, Stutz, Stearns, Winton, Peerless, Nordyke-Marmon, Northway, National, Mercer, Hupp, Kelly-Springfield Truck, Hercules, General Motors Truck, Kissel, Haynes and Franklin.

Total assets on Dec. 31, 1916, were $436,267.95. Current assets were $181,786.46, of which $92,239.14 was cash, $59,943.72 accounts receivable and $29,503.16 inventories of work in progress of construction and materials. Current liabilities were $25,487.79. Net working capital amounted to $156,298.68.

The company's net earnings for 1916 were $137,488.81, equivalent to $18.33 a share on the 7500 shares of common which are without par value. The balance sheet shows assets in excess of liabilities amounting to $160,780.16, or $21.44 a share for the common stock on Dec. 31. The company's net earning rate in February of this year was at the rate of $165,000 a year. Plans are arranged for an addition to the present plant which will double its output.

Hoosiers Talk War March 30

INDIANAPOLIS, March 24—The function of automobile engineers at war time will be one of the subjects of the March 30 meeting of the Indiana Section, S. A. E. This will be discussed by F. E. Moskovics, of the Nordyke & Marmon Co., and a member of the council of the S. A. E. Other papers will be presented by Ferdinand Jehle, service engineer of the Aluminum Castings Co., on problems of aluminum engine construction. Mr. Nelson, of the engineering department of the Premier company, will touch on the peculiarities of camshaft design for aluminum overhead engines, and Albert Champion, vice-president Champion Ignition Co., will tell about plug limitation in high-speed engines.

Brown, of Kelley Truck, Dead

CHICAGO, March 27—W. H. Brown, vice-president and treasurer of the Kelley Convertible Auto Truck Co., died March 19.

Personals of the Week in the Industry

DETROIT, March 23—W. C. Durant, president of the Chevrolet Motor Car Co., is making a business trip to California and will return East April 6.

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DETROIT, March 24—C. L. Jenney has joined the Detroit Motor Lock Co. as consulting engineer. This company has been manufacturing a Ford magneto lock, known as the Detroit Cartridge lock, and is now preparing to extend its business by manufacturing a full line of locks for other cars.

It is reported that Mr. Jenney has perfected a new principle in the kerosene carbureter field. A demonstration will be made in Detroit in the near future.

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NEW YORK, March 26—James Guthrie, whose association with the Dey Electric was recently announced, will continue his consulting practice in the Erie Bldg., Cleveland. His connection with the Dey Electric is that he will take care of the purely automobile features, Dr. Steinmetz continuing to look after the electrical portions.

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PITTSBURGH, PA., March 24—F. L. Pratt has become factory manager of the Pennsy Motors Co. He has been in the automobile industry for 13 years. He was associated with the Buick, Everitt-Metzger, Columbus Buggy and Firestone-Columbus companies.

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KOKOMO, IND., March 24—R. T. Gray, advertising manager of the Haynes Automobile Co., has resigned to accept a position with the Shuman Advertising Co., Chicago. Mr. Gray has been in charge of the Haynes advertising department for the past 2 years.

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SEATTLE, WASH., March 23—W. E. Darden has been made division manager for the Prest-O-Lite Co. with headquarters in Seattle. He will have charge of Oregon, Washington, Idaho, Montana and Alaska. He is succeeded as branch manager by J. L. Merritt.

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DETROIT, March 27—R. M. Heidey, superintendent of the experimental department of the Packard Motor Car Co., has been promoted to assistant manager of the truck department.

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TULSA, OKLA., March 27—W. A. King, production manager of the Tulsa Automobile Co., has resigned his position to become the general manager and engineer of a new company to be formed in Oklahoma City which will manufacture a light six.

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DETROIT, March 28—G. D. Wilcox, Jr., advertising manager of the Detroit Lubricating Co., has resigned to become advertising manager of the Republic Motor Truck Co., Alma, Mich.

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DETROIT, March 22—James J. Harrington, assistant sales manager, has been appointed manager of the Ford branch and assembly plant at Cambridge, Mass. K. D. Sheldon, assistant manager of the Ford branch at Toledo, Ohio, has been appointed assistant manager of the Cambridge plant.

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MINNEAPOLIS, MINN., March 23—E. C. Thompson has taken the agency for the Doble steam cars for Minnesota and the Dakotas.

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LOS ANGELES, CAL., March 24—O. B. Henderson has been appointed permanent manager of Los Angeles of the Willys-Overland Co.

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NEW YORK, March 23—L. G. Peed has been appointed sales manager for the Willys-Overland Co., New York.

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NEW YORK, March 23—R. F. Brown has joined the staff of the Guaranty Securities Corp. and will travel in New England territory.

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DETROIT, March 26—Louis Logie, sales supervisor for the Provinces for the Maxwell Motor Sales Corp., has been appointed as Canadian Maxwell supervisor in charge of both sales and service for the entire Dominion.

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CINCINNATI, OHIO, March 26—C. H. Kloo, Jr., has been appointed to take charge of the sales promotion department of the United States Motor Truck Co. and to act as assistant to F. J. Alvin, general sales manager. Mr. Kloo was formerly with the National Cash Register Co.

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NEW YORK, March 23—H. M. Applegate has been appointed assistant sales manager of the American Motors Corp. He will continue as advertising manager also.

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DETROIT, March 26—F. C. Wood, former manager of the Wood-Oakland Co., Cleveland, has been appointed vice-president and sales manager of the Champion Motors Co., Fulton, Ill., and Cleveland. Mr. Wood retains his financial interest in the Woods-Oakland Co., but will devote his time and attention to the Champion company.

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DECATUR, ILL., March 24—G. V. Beck has become general sales manager of the Comet Automobile Co. He was district manager of the Chalmers Motors Co., Detroit; Western sales manager of the Detroiter Motor Car Co., and recently sales manager of the Elgin Motor Car Corp., Chicago.

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TRENTON, N. J., March 26—J. H. Liston, western manager of the Thermoid Rubber Co., with headquarters in Chicago, has resigned to accept a position with the sales organization of the Standard Parts Co., Cleveland. D. O. Pohlman, for several years sales manager of the Thermoid company, has succeeded him as western manager. Mr. Pohlman in turn has been succeeded by H. F. Blanchard, who was formerly district manager for the company at Philadelphia.

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DETROIT, March 23—H. P. McQuiston has been appointed in charge of the newly created used car division of the sales department of the Chalmers Motor Car Co. He will give selling and advertising assistance to Chalmer dealers on used cars.

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ST. LOUIS, MO., March 26—J. J. Hartley, for 4 years with the Wagner Electric Co., has been appointed manager of the Dorris Motor Car Co. factory. Prior to becoming a superintendent of the Wagner Co., Mr. Hartley was with the Standard Arms Co., and prior to that was with the Mitchell-Lewis Motor Co., Racine, Wis. An increase of 50 per cent output is being planned for the Dorris plant.

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NEW BRITAIN, CONN., March 22—Edw. E. Launier has been appointed advertising manager of the Eastern Motors, Inc., maker of the Charter Oak car. Mr. Launier has been connected with the advertising department of Colgate & Co. and the Columbia Graphophone Co. and was advertising manager of the American Hosiery Co., this city.

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CHICAGO, March 23 — Maurice Needham has resigned as general manager and treasurer of the Bailey Non-Stall Differential Corp. to become associated with the Barrett-Cravens Co., manufacturer of the Barrett multi-truck, time clocks and other factory equipment, Chicago.

Mr. Needham will assume his new duties shortly. He was formerly advertising manager of the Thomas B. Jeffery Co., now the Nash Motors Co., Kenosha, Wis.

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DETROIT, March 23—M. E. Maloney has resigned from the purchasing department of the Hupp Motor Car Corp. Mr. Maloney will be associated with F. E. Bowers as a manufacturers' representative.

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DETROIT, March 22—Jack Gable who was a mechanic for the late Bob Burman has been added to the racing team of the Hudson Motor Car Co.

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Johnson Overseas Advertising Service

NEW YORK, March 28—Proprietors of *The American Exporter* have organized the Johnson Overseas Advertising Service to handle the placing of American advertising in foreign publications. As reported last week in THE AUTOMOBILE, Frank B. Amos, Studebaker foreign advertising manager for the past 5 years, has resigned to become manager of the Johnson organization.

Tire Price Rise Predicted

U. S. Rubber Turning Out Rubber from Its Plantations at 17 Cents a Lb.

NEW YORK, March 22.—Another advance in automobile tire prices is imminent, in fact it may come within a month, according to Colonel S. P. Colt, president of the United States Rubber Co. This company is now manufacturing 12,000 tires a day, and with the completion of its new additions to the Morgan & Wright plant in Detroit the capacity will be brought up to 14,000 tires a day. An advance in tire prices is only in line with the steadily advancing cost of crude rubber and fabric.

At the present time the United States Rubber Co. can turn out rubber from its own plantations in Sumatra at a cost of 17 cents a pound. The same rubber is selling in the open market at 84 cents a pound.

It has 14,000 employees on its plantation in Sumatra. All but 200 of these receive a salary of 15 cents a day. For the same sort of work in the rubber forests of Brazil workers receive from $1.50 to $2 a day.

About $10,000,000 is invested by this company in its far eastern plantation. This includes an original investment of about $8,000,000 and interest charges of about $2,000,000.

About 15 per cent of its crude rubber needs will be taken care of this year from its own plantations. This percentage will be increased to 25 per cent in 1918. In 1921 the United States Rubber Co. should secure about half of its crude rubber requirements from its own plantations, that is half of the requirements on the basis of present sales of the company, states Colonel Colt.

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Niles Co. Discontinues Manufacture of Motor Trucks

NILES, OHIO, March 22—The Niles Car & Mfg. Co., making motor trucks and cars for electric railways, has decided to discontinue the manufacture of motor trucks. It is stated that there is a chance of its considering the manufacture of self-propelled interurban cars.

Originally the corporation manufactured street cars and had developed an extensive business in that line. In an experimental way it started the manufacture of motor trucks some time ago. At first 1-ton trucks were produced and later heavier types were turned out.

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Newtone Horn Plant on Block

NEW YORK, March 27—A receiver has been appointed for the Automobile Supply Mfg. Co., maker of the Newtone horn. The company has put its plant, materials and good-will on the block. The sale was scheduled for yesterday but was postponed to April 9.

There is a possibility that the company will become a going concern again. Several large creditors are now working to this end, and for this reason yesterday's sale was postponed.

The company will be remembered for its participation in the suit brought by the Lovell-McConnell company, maker of the Klaxon back in 1914, when it was charged with having infringed the Miller Reese Hutchison patents, owned by the Klaxon company.

The company has been fairly active during the last year. The horn business was started in 1904. The company has specialized in brass specialties.

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Kelly-Springfield Co. to Raise Tire Prices

NEW YORK, March 28—The Kelly-Springfield Tire Co. has decided to increase its tire prices. A meeting was held last night at which it was decided to raise the price on April 1. Though no announcement as to what the increase will be has been given out, it is believed that these details are being withheld for the near future at which time other companies are expected to declare their intention of raising prices.

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Mutual Motors Increases Organization and Production

JACKSON, MICH., March 26 — The Mutual Motors Co., maker of the Marion-Handley car, will increase its production 300 per cent April 1. To take care of this two new members have been added to the organization. G. E. Drawe has been appointed assistant general manager and H. R. Cooley, sales manager. Mr. Drawe occupied the same position with the Allen Motor Co., Fostoria. Mr. Cooley has been in sales organization work with the Jackson Automobile Co., and latterly with the Lewis Spring & Axle Co., Chelsea, Mich. D. B. Williams, one of the directors and secretary, has up to now handled all matters relating to sales and advertising. Hereafter he will give attention to advertising and sales promotion work, retaining a continuous contact with the sales department in an advisory capacity.

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Koehler 1¼-Tonner Supplants 1-Ton Model

NEWARK, N. J., March 27—The H. J. Koehler Motors Co. has brought out a new model styled K-1¼, which will supplant the model K 1-ton truck. The new vehicle has a four-cylinder, 35-hp. overhead valve motor, with increased compression and lighter pistons. Rear tires are larger, as are spoke sizes, and the front wheel spindles are 2 in. in diameter. Drive is by internal gear and ignition by either Eisemann or Heinze magneto. Between 2000 and 3000 trucks will be produced by Jan. 1, 1918. Deliveries are now being made.

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Canadian War Order for Chalmers

DETROIT, March 26—The Chalmers Motor Co. of Canada recently secured an order for 100 Chalmers cars from the Dominion war department.

Darling Motor in Dayton

Takes Wright-Martin Plant—New Car is Design of James Guthrie

DAYTON, OHIO, March 23—The plant of the Wright-Martin Aeroplane Co. has been sold to the Darling Motor Co., a new concern which will use it for the manufacture of automobiles. The Wright-Martin Co. has not decided as to the disposition of this equipment, but there is a possibility of it being shipped to the New Brunswick plant where the motors are made.

The new car to be made by the Darling company is the design of James Guthrie and has the same chassis type with several different body styles. These are straight line effect with double cowl.

The chassis comprises a 3½ by 5¼ model 7-N Continental six motor. Other features include Timken axles, with spiral bevel drive; Borg and Beck disk clutch; Stromberg carburetor; Bijur starting and lighting; Kellogg tire pump; Atwater Kent ignition; Stewart vacuum feed; Conaphore lenses; demountable wire wheels; 130-in. wheelbase; Boyce Moto-Meter, and other features.

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Stewart-Warner Sells Electric Clock Business

BELOIT, WIS., March 26—The Waverly Novelty Co., with headquarters in Pittsburgh, Pa., has purchased the electric clock business of the Stewart-Warner Speedometer Co., and for the present the manufacture of these devices will be carried on in leased quarters in the Warner works at Beloit, Wis., where the electric clock was developed under the former Warner Instrument Co. auspices previous to its consolidation with the Stewart industries. E. M. Thompson, inventor of the clock, has resigned his position with the Beloit or Warner works after 11 years of association, to take charge of the Waverly company's new division. For the present, while old contracts of the Stewart-Warner company are being filled, the Waverly company will be located in the Warner works, but as soon as possible it will arrange to establish a factory of its own. The Stewart-Warner company has not pushed the electric clock business in recent months and a short time ago decided to discontinue it altogether, but accepted the offer of the Waverly company to take it over.

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FACTORY NEWS

CANTON, OHIO, March 26—The Holmes Automobile Co. has bought the east plant of the Republic Stamping & Enameling Co. The deal transfers to the new concern the buildings and a tract of 23 acres and involves an expenditure of more than $300,000.

Experimental work on the Holmes air-

cooled car will be started immediately. It is expected that production will be started next December.

The company will produce about 4000 cars during the first year, selling for nearly $2,000 each. Instead of but one design car, however, the Holmes company has determined to make a chassis of 125-in. wheelbase, and supply either four-passenger or seven-passenger bodies. The cars will be ready for the New York automobile show in January.

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JOLIET, ILL., March 24—The Cruiser Motor Car Co. has decided to construct a plant in this city and a site is now under consideration. The company will manufacture a car which will appeal to campers, a self-contained outing and camping outfit being included in the specifications. W. J. Burdick, lately associated with the New Era Engineering Co., recently absorbed by the Elgin Motor Car Corp., has been chosen president of the Cruiser company. R. G. Jones, who also was with New Era, has been chosen vice-president. D. S. Bobb is secretary, and W. E. Burdick, treasurer. The capital stock has been fixed at $250,000.

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DETROIT, March 24—The first of the machinery for the Harroun Motor Corp. plant has been installed. The floors of the manufacturing and assembly buildings have been laid, and as rapidly as these harden the machinery is going into the plant. The floors are being laid from the ends of the T-shaped building, laid out towards the center, and the machinery is following this up as rapidly as the floors harden enough to form a substantial base.

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PORT HURON, MICH., March 23—The Monroe Motor Car Co., formerly the Port Huron Construction Co., has purchased the property just south of the Ladies' Library building, and will erect an addition. The new building will be about 70 by 35 ft. The company is getting under production at its Pontiac plant and will turn out about 5000 cars this year.

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CHICAGO, March 23 — Plans are now being completed for the erection of additional factory buildings to the plant of the Elgin Motor Car Corp. in Chicago. These plans will give the company three times the present factory space and will provide for an annual output of from 20,000 to 25,000 cars. The Elgin Co. is now working on an output of 7500 cars for the current year.

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Mott Wheel May Move to Jackson

UTICA, N. Y., March 28—The Mott Wheel Works will move from this city to Jackson, Mich., if the Chamber of Commerce there is able to raise an $80,000 stock subscription. The company wants to move to that city because the Perlman Rim Co. owns a half interest in its plant and as the Perlman company intends, within a short time, to move its shares to that city the Mott company desires to move entire plant.

West Detroit Fast Developing

22 Car and Parts Manufacturers Move to Growing Factory Center

DETROIT, March 26—The west side of Detroit is rapidly developing as a manufacturing center. Twenty-two makers of automobiles and parts are moving to, or opening branches in, that section and will bring 30,575 employees there. Improved shipping conditions and the coming of the Pennsylvania Railway are the reasons for this active development.

If the Ford tractor, which it is expected will be manufactured in that vicinity of the city, conforms to forecasts another 50,000 workers will be added.

Among important companies involved are the Cadillac Motor Car Co., Paige-Detroit Motor Car Co., Saxon Motor Car Corp., Fisher Body Corp. and the Springfield Metal Body Co.

Some of the companies which have recently built or are building factories or additions are:

Ford Motor Company's blast furnace and tractor plant. The blast furnace will employ 500 men this year; number of tractor employees given as 50,000 eventually by Henry Ford.
Cadillac Motor Car Co., to employ 15,000 men.
Saxon Motor Car Co., to employ 2500 men within a year.
Paige-Detroit Motor Car Co., to add 2000 employees.
Studebaker Corp., addition to Plant 3 and to add at least 2000 men.
Federal Motor Truck Co., two additions; to add 450 men.
The Fisher Body Corp., to employ 2000 men.
The Springfield Metal Body Co., to employ 2500.
The England Mfg. Co., completing a new factory and add 125 men.
The Detroit Seamless Steel Tube Co., employing 1000 men.
Ireland & Matthews Co., moving to its new plant and affecting 700 men.
Edmunds & Jones, employing 650 men.
The Holihan Mfg. Co., to add 200 men.
Turner & Moore, motors, employing 175 men.
Disco Electric Corp., to employ 200 men.
Peninsular Smelting Works, employing 100 men.
Buhl Stamping Co., employing 350 men.
Parsons Mfg. Co., employing 200 men.
Kelsey Wheel Co. will add 500 men, with a total of 2500.
Roberts Brass Mfg. Co., to add 300 men, making total of 650.
Based on the estimate of 4.69 persons in a family, these changes will affect 143,397 people.

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11,000 Firestone Employees Buy Stock

AKRON, OHIO, March 22—More than 11,000 employees of the Firestone Rubber Co., over 90 per cent of the persons employed, have made use of the opportunity to buy stock of the company. Stock was sold to employees below current quotations on an easy payment plan described in a previous issue of THE AUTOMOBILE.

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Goodyear Plans $450,000 Clubhouse

AKRON, March 26—The Goodyear Tire & Rubber Co. will build a clubhouse at a cost of $450,000, which will be known as Goodyear Hall, and will be devoted to the activities of the 19,000 Goodyear employees. There will be a large gymnasium, an auditorium seating 5000, a swimming pool, rifle range, shower baths, bowling alleys, club rooms and a few more accessories. The club will be within walking distance of Seiberling field, devoted to the athletic activities, and Goodyear Heights, where 500 Goodyear employees now live with their families and where room for 5000 more is being constructed.

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Goodrich Single Men Start Clubs

AKRON, March 26—The B. F. Goodrich Co. employees are starting the experiment of getting small clubs for single men, and the Chelsea Club, the first of these, with accommodations for fifty men, has just opened its doors. A three-story building has been leased for the organization.

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Chalmers Officers' Club Formed

DETROIT, March 22—The Officers' Club of the Chalmers Motor Co. was organized here yesterday to promote co-operation at a special luncheon in the factory cafe. Over 100 heads and their assistants attended and heard addresses by Circuit Court Judge Alfred Murphy and E. C. Morse, vice-president and general manager of the Chalmers company. Officers and department heads will meet every noon in the club dining room.

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Rubber Workers Given 8-Hr. Day

CUYAHOGA FALLS, OHIO, March 26—The Marathon Tire & Rubber Co. has installed an 8-hr. full pay basis for its employees. The new rule starts to-day. Three shifts of 8 hr. each will be run. The company employs about 200 men.

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Studebaker Officials to Move

DETROIT, March 28—All of the Studebaker advertising and sales officials will move to South Bend Friday. This company is holding an industrial patriotism meeting to-morrow for its 7000 employees. Judge J. B. Murphy will address the employees on American citizenship and what it means.

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Republic Rubber Offices Moved

NEW YORK, March 24—The general offices of the Republic Rubber Co. will be moved April 1 to the Singer Building. The mechanical sales, railroad sales, export sales and accounting departments will be included. The pneumatic tire sales department and storage rooms will remain at 229 West 58th Street.

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1000 Coles a Month

INDIANAPOLIS, March 24—The 10,000-car production campaign of the Cole Motor Car Co. is under way. New machinery has been installed and the floor-space will be increased by the addition of new department quarters. A schedule has been formally approved which provides for the shipment of a minimum of 1000 cars monthly.

N. J. Raises Truck Fees

Vehicles with Solid Tires Taxed by Weight — Other Trucks By Horsepower

TRENTON, N. J., March 24—Following in New York State's footsteps, New Jersey to-day enacted into law a measure increasing the license fees of all commercial vehicles other than those equipped with pneumatic tires. The bill was based upon the findings of the engineering committee whose report was submitted to the legislature Jan. 23, 1917. It was signed by Governor Edge and is to go into effect Jan. 1, 1918.

The schedule of license fees as set forth in the new bill is based upon the gross weight of vehicle and load and will replace the present method of charging an additional $10 to the fee provided under the present law and paid under a horsepower rating as follows:

Motor vehicles of 10 h.p. or less.....$4.50
Motor vehicles of 11-29 h.p..... 7.50
Motor vehicles of 30 h.p. or more.....15.00

The new fees are practically the same as those now in force in New York State but are slightly less for the larger-capacity vehicles than the original recommendations of the New Jersey committee as submitted to the legislature Jan. 23, 1917. The fact that the new fees will not go into effect before another 9 months will permit motor truck interests to protest against the largely increased fees, a condition which the owners in New York State were not so fortunate in obtaining due to the fact that the bills in that state were railroaded through the legislature without sufficient time for protestation.

The new New Jersey fees and the comparison between them and those originally offered by the engineering committee and a comparison with the fees now in force in New York State are given below.

Gross Weight of Vehicle Including Load	N. J. Fees Effective Jan. 1, 1918	N. J. Fees Proposed by Com.	Present N.Y. Fees
4,000 lbs. or less	$15.00	$15.00	$10.00
4,001 to 5,000	17.00	17.50	15.00
5,001 to 6,000	19.00	20.00	15.00
6,001 to 7,000	21.00	22.50	20.00
7,001 to 8,000	23.00	25.00	20.00
8,001 to 9,000	25.00	27.50	25.00
9,001 to 10,000	27.00	30.00	25.00
10,001 to 11,000	29.00	32.50	30.00
11,001 to 12,000	31.00	35.00	30.00
12,001 to 13,000	33.00	40.00	35.00
13,001 to 14,000	35.00	45.00	35.00
14,001 to 15,000	37.00	50.00	40.00
15,001 to 16,000	39.00	55.00	40.00
16,001 to 17,000	41.00	60.00	45.00
17,001 to 18,000	43.00	65.00	45.00
18,001 to 19,000	45.00	70.00	50.00
19,001 to 20,000	47.00	75.00	50.00
20,001 to 21,000	49.00	81.25	55.00
21,001 to 22,000	51.00	87.50	55.00
22,001 to 23,000	53.00	93.75	60.00
23,001 to 24,000	55.00	100.00	60.00
24,001 to 25,000	57.00	106.25	65.00
25,001 to 25,875	59.00	112.50	65.00

It is also provided that commercial vehicles not subject to a registration fee based upon the gross weight of the vehicle as outlined above will continue to be subject to a registration fee based upon horsepower at the rate previously given in this article. This means that a 2-ton motor truck equipped with pneumatic tires all around will pay a license fee according to the horsepower of its motor.

The law further provides that if any truck is registered after the first day of September of any year the fee required shall be but one-half of the registration fee as provided above.

Stewart-Warner Patent Suit

CHICAGO, March 27—The Stewart-Warner Speedometer Corp. has filed suit here against the Auto Parts Co., Chicago distributer of the Thermos vacuum fuel feed system, manufactured by G. F. Weinberg, Detroit. The suit is based on the Webb Jay patents, under which the Stewart system is manufactured, and is in harmony with others recently instituted. The suit is in the United States District Court.

Faw Bulb Reflector Patent Upheld by Court of Appeals

NEW YORK, March 23 — The United States Court of Appeals has now affirmed the decision of the lower court which dismissed the suit brought by N. J. Quinn on behalf of the Perrin no-glare deflector against J. H. Faw, Inc., handling the Lennon light protector. The patent involved was No. 1,099,715, covering the construction of a bulb reflector, half of the bulb being covered by a silver coating. The Faw device is a detachable metal covering, and not a coating upon the glass. The element of adjustability also entered into the question. The decision of the lower court was made last July.

Auto Parts Wins Name Suit

CHICAGO, March 23—The similarity of names between the Auto Parts Co. and the Auto Sales & Parts Co., both manufacturing jobbers and dealers of Chicago, has resulted in the decision by Judge Charles M. Foell, of the Superior Court of Cook County, in favor of the Auto Parts Co., perpetually enjoining the Auto Sales & Parts from using a name similar to that of the Auto Parts Co. It also was decreed that the Auto Parts Co. have a right to an accounting to ascertain the damages sustained and the profits lost. It is understood that the Auto Sales & Parts Co. in the future will be known as the Auto Needs Co., this change having been made before the decision was rendered. The Auto Needs Co. has appealed.

Thropp and DeLion Not Connected

NEW YORK, March 24—There is no connection between the John E. Thropp Sons Co., manufacturers of tire machinery, and the DeLion Tire & Rubber Co. of New York, with a factory in Trenton, N. J. The writer of a recent DeLion advertisement stated that the DeLion factory is operated and controlled by the Thropp company, whereas the Thropp company is not in any way connected with the DeLion company. DeLion, however, uses the Thropp system in manufacturing its tires.

New Texas License Law

Registration for Entire State Under New Measure—Uniform Traffic Rules

AUSTIN, TEX., March 23.—The bill of which Representative R. L. Carlock, of Fort Worth, is the author, providing for the licensing of motor vehicles and establishing traffic regulations of such vehicles for the entire State, making these uniform, was finally passed by the Legislature. This bill, which was patterned largely after the California law, also contains features of the Maryland and Illinois laws.

The speed limit in the country is placed at 25 m.p.h. and at 18 in cities and residence districts; 15 m.p.h. in business districts of small cities and towns, and 10 miles in the larger cities. The dimming of lights is also required.

Another measure of no inconsiderable importance to garage men and automobile owners of Texas that was enacted into law is that which provides that all repair shops shall keep an accurate record of the number and owner of all automobiles and other motor vehicles repaired by them.

Ohio Passes Light Bill

COLUMBUS, OHIO, March 23—The Ohio General Assembly has enacted a law compelling all vehicles, with the exception of hay and straw wagons, to carry lights visible to the front and rear. This law is the result of 3 years' work on the part of automobile clubs, which have always insisted that all vehicles should be provided with lights. The bill was introduced by Representative Terrell of Cuyahoga county and was enacted by both houses of the legislature.

W. Va. Cars Taxed by Weight

CHARLESTON, W. VA., March 26—Automobiles will be taxed according to their weight in this state, beginning May 23. The law fixes the license fee at $10 a year for automobiles weighing 2000 lb. or less, and 25 cents additional for each 100 lb. over that.

Road Test for Massachusetts Drivers

BOSTON, March 24—Every automobile owner will have to pass a road test, according to a bill which has had its first reading in the lower branch of the legislature. The dealers here are disturbed, as it would hurt them. New buyers, it is expected, would insist on having more lessons, and be allowed to take cars downtown in traffic where they would have to pass the road tests.

Ford Wins Before Committee

LANSING, MICH., March 22 — Henry Ford won another round in his controversy with Dodge Brothers. The senate committee of banks and corporations to-

day decided to report out the bill which is known as the Dodge-Ford bill with but one amendment. Instead of making the sky the limit for corporations in the state, as the bill asked for, the limit has been placed at $75,000,000. The amendments which the Dodge Brothers sought to have in the bill providing that a minority stockholder could upset the entire framework of the corporation to fit the exact case of the Dodge-Ford suit were all refused by the committee.

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Bidwell Pleads Guilty—Fined $1,000

BUFFALO, N. Y., March 21—Alfred C. Bidwell, president of the so-called International Automobile League and the International Automobile League Tire Company, was fined $2,000 by Judge Edwin S. Thomas in the United States District Court to-day after pleading guilty to a consolidated indictment charging conspiracy to use the mails to defraud and actual use of the mails to defraud.

The International Automobile League and the International Automobile League Tire Co. were each fined $1,000 after pleas of guilty were entered for each corporation by Frank Abbott, counsel for Bidwell. Bidwell paid his fine to the clerk immediately. The fines imposed upon the corporations were not paid in the court room.

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Dodge Bros. Incorporate in Canada

WINDSOR, ONT., March 22—The Dodge Brothers Motor Co., Ltd., has been incorporated with a capital stock of $100,000 by J. F. Dodge, H. E. Dodge, F. J. Haynes and others, all of Detroit, to manufacture automobiles, etc. A plant will be placed in this city.

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Champion Spark Plug in Canada

WINDSOR, ONT., March 24—The Champion Spark Plug Co. of Canada, Ltd., has secured a Dominion charter. The capital stock is $100,000 divided into 1000 shares of $100 each. The chief place of business will be in Windsor. The incorporators are R. A. Stranahan, F. D. Stranahan, F. B. Caswell of Toledo, O. E. Fleming, K. C. and A. H. Foster of Windsor.

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New Van Sicklen Contracts

CHICAGO, March 26—The Van Sicklen Co. reports that new contracts for speedometer equipment have been made with the Grant Motor Co., Cleveland; Stephens Motors, Freeport, Ill.; Moon Motor Car Co., St. Louis, Mo.; Emerson Motor Co., Kingston, N. Y.; Velie Motors Corp., Moline, Ill.; Rock Falls Mfg. Co., Sterling, Ill., and the Piedmont Motor Car Co., Lynchburg, Va.

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Pullman Gray & Davis Equipped

BOSTON, March 27 — The Pullman Motor Car Co., York, Pa., has adopted Gray & Davis lamp equipment for the coming season.

Test Motor Truck Brakes

Alertness of Driver is Main Factor in Stopping, N. Y. Tests Show

NEW YORK, March 25—That the alertness and quickness of the motor truck driver is the most important factor in bringing motor trucks to a stop was the outstanding result of a series of brake tests on seven trucks held here to-day by the New York Police Dept. and The Motor Truck Club of America.

The police officials have maintained that large capacity motor trucks such as those of 5 or 6-ton burden should not be allowed to travel as fast on the city streets as vehicles of 1 or 2-ton capacities, under the belief that the large vehicles running at a speed in excess of 10 or 12 m.p.h. could not be stopped in a sufficiently short space to prevent damage if a collision were imminent. This opinion was not sustained by the results of the test, as, for instance, a 1-ton Hudford, composed of a Ford chassis and the Hudford adapter, weighing light 3270 lb. in all, was stopped in 29 ft., 11 in. at a speed of 15 m.p.h., whereas a 5-ton Mack AC weighing 10,530 lb. running at the same speed was stopped at 30 ft., 1½ in.

Some interesting results are obtained by comparing the distances in which the various trucks wer stopped when light and loaded, at the same speed in each case. For instance, a 5-ton Pierce-Arrow, weighing 11,250 lb. light, and running at its maximum speed of 14.5 m.p.h., was stopped in 24 ft., 11 in. and when loaded, in 25 ft., 6 in. A 3½-ton Diamond-T weighing 9310 lb. light, was stopped in 29 ft., 6 in. when running at 15 m.p.h. and in 54 ft., 3 in. when loaded and weighing 15,310 lb. This would tend to show that it requires a greater distance to stop a loaded vehicle than the same truck light when traveling at the same speed.

The test was carried out on a smooth asphalt street in good conditions with a slight crown to the road and a down grade of approximately 2 per cent. The method of conducting the test consisted of lining up the trucks one behind the other and then starting each one down the street paced by a motorcycle at a given rate of speed. This rate of speed was maintained up to a chalk line on the street. On crossing the line the driver applied both foot and hand brakes. The distance required to stop was then measured from the hub of the front wheels to the chalk line over which the vehicle had crossed.

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N. A. C. C. Traffic Dept. Interprets Car Service Rules

NEW YORK, March 24—In order that its members may be fully informed as to the loading of automobiles permitted in any car available, the traffic department of the National Automobile Chamber of Commerce has prepared the following interpretation of the rules in regard to shipments. There is quite a difference of opinion among railroad agents on how cars may be loaded under the new car service rules. In some cases the agents have refused to allow cars to be used under circumstances not justified by the rules. Reference to the rule controlling each interpretation is given in parenthesis so that the shippers may readily refer freight agents to the maker's authority, if necessary.

INTERPRETATION OF CAR SERVICE RULES

1. A car on the line of the owning road may be loaded to any point via any route.

2. A car not owned by the line on which it is located (viz: a "foreign" car) must be loaded according to two general principles—it depends on whether the car is:

(a)—Owned by a direct connection of the road on which it is located, and if so, whether it is standing at a point of interchange with the owning road.

(b)—Owned by a road which is not a direct connection of the road on which it is located.

3. Foreign car belonging to a direct connection may be loaded:

To a point on the owning road (Rule 2A).

To any other point providing the owning road can and does participate in the freight rate (Rule 2A).

(It may be used as above via any route that permits the owning road to participate in the freight rate (Rule 2A) **except that if loaded at a point where the owning road connects with the road on which the car is standing, it must after loading, be delivered by switch movement to the owning road) (Rule 2B).**

To a point on the line on which the car is standing **provided it is in the direction of the home road.** (Rule 1 B-I.)

To a point on the line on which the car is standing **in an opposite direction from the home road provided the line on which the car is standing intends to reload at destination to, via or locally in the direction of the owning road, and has not previously permitted a similar use of the car.**

4. A foreign car belonging to a line which is NOT a direct connection of the road on which the car is standing may be loaded:

To a destination which takes it to the owning road (Rule 3A).

To any point if routed so that the owning road participates in the freight rate (Rule 3A).

To any point on a direct connection of the owning road (Rule 3B).

To any point on any road forming a part of the home route (Rule 3C).

To a point on the line on which car is standing provided it is **in the direction of the home road** (Rule 1 B-I).

To a point on the line on which car is standing provided it is **in the direction of the home route** (Rule 1 B-I).

To a point on **the line on which car is standing in an opposite direction from the home road or home route,** provided first—that it is to be reloaded in accordance with one of the other provisions of this section and, second—that the line on which car is standing has not previously used the car in this manner, only one such movement being allowed. (Rule 1 B-II.)

7. Any road has the right to agree with any other road to deviate from the rules in the handling of their cars (Rule 1-f).

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New Republic Truck Tire

YOUNGSTOWN, OHIO, March 26 — The Republic Rubber Co. is marketing a new type of channel base pressed-on truck tire. It is designed to carry greater loads than previous types and is constructed of prodium process rubber. The tires are made in all sizes and Republic branches are being equipped with presses to facilitate prompt service. The company will immediately extend its plant to treble production. Theodore F. MacManus, who has been connected with the Goodyear Tire & Rubber Co., will be advertising and business counsel.

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CLEVELAND, March 27—The Bearings Service Co. will open a branch in this city April 2.

Makers Buying Much Steel

Government Also Closing Contracts for Equipment in Preparation for War

DETROIT, March 26—Interest in the steel trade is now concentrated upon the United States Government requirements to put the nation on a war footing. Compared with the output of mills, the needs for army and navy equipment will not be heavy, but buying for these purposes is already attracting attention. The government has closed contracts for 16,000 tons of armor plate ordered a week ago and additional contracts for 50,000 tons of steel follow the recent orders placed for 98,000 tons. Makers of war munitions are also seeking about 10,000 tons of steel bars, and improvements to private ship yards and navy yards will require 30,000 tons, while about 5000 tons will be needed for airplane hangars. As a step toward meeting government requirements a virtual embargo has been placed on exports.

Fabricating shops report orders for 25,000 tons, including 6500 tons for railroad bridges. The balance is mainly for building and plant extension purposes. Automobile makers are conspicuous among domestic buyers, placing large orders for steel bars and other necessary supplies. This may to some extent be regarded as preparation for war.

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Prices of Steel Higher

DETROIT, March 26—The tendency of steel prices continues sharply upward. There is considerable activity in pig iron, several important manufacturing industries covering their requirements for the first half of 1918.

Sales in Eastern territory alone this week amounted to 75,000 tons, and price advances ranged from $1 to $2 a ton on foundry, basic and bessemer iron, and $5 per ton on low phosphorous iron.

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Famous Trucks Elects Officers

ST. JOSEPH, MICH., March 23—At a meeting of stockholders of Famous Trucks, Inc., St. Joseph's latest business venture, officers and directors were appointed as follows: R. H. Grotfeld, Chicago, president; C. E. Frederickson, vice-president and general manager; John J. Seltenreich, general superintendent and purchasing agent. These with the following form the board of directors; F. E. Robinson of Cleveland; J. R. Howe, Chicago; W. H. Black, Decatur, Ill., and D. A. Levy, Chicago, Ill.

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U. S. Rubber Elects Officers

NEW YORK, March 22—S. P. Colt was to-day re-elected president of the U. S. Rubber Co., at the directors' meeting. The other officers elected are: J. B. Ford and Lester Leland, vice-presidents; R. B. Price, vice-president in charge of development department; H. E. Sawyer, vice-president in charge of foot-wear department; E. S. Williams, vice-president in charge of mechanical department; Samuel Norris, secretary; J. D. Carberry, assistant secretary; W. G. Parsons, treasurer. A. J. Hathorne, asst. treasurer.

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CHANGES OF CAPITAL

CINCINNATI, March 26—The Highland Body Mfg. Co. has increased its capital from $81,900 to $150,000.

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AKRON, March 24—The American Rubber & Tire Co. of this city has increased its capital from $500,000 to $1,000,000. Officers of the company state that the increase was made to take care of growing business to give more working capital, to purchase new material and to finance a new addition. A new building costing $40,000 will be erected at once.

At the organization meeting F. H. Snyder was re-elected president. J. W. Rock of Akron, succeeds C. Dietz as vice-president. G. W. Kratsch is re-elected secretary and treasurer.

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TRENTON, N. J., March 22—Having recently entered the field for the manufacture of automobile delivery bodies, the C. V. Hill Co. has placed upon the market a stock issue of $100,000 in 7 per cent cumulative preferred stock, that will pay interest Feb. 1 and Aug. 1. This company has been manufacturing since 1890, specializing in refrigerators, etc.

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Spring Contracts Reach Into 1918

CLEVELAND, March 23—The Standard Parts Co. is taking many contracts which reach into 1918 requirements of automobile manufacturers. One recent contract for springs totals $250,000.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.58	.58	.58	.60	.61	.61	+ .03
Antimony, lb.	.33	.34	.34	.34	.35	.35	+ .02
Bessemer Steel, ton	70.00	70.00	70.00	70.00	70.00	70.00	...
Copper, Elec., lb.	.36	.36	.35	.35	.34½	.34½	— .01½
Copper, Lake, lb.	.36	.36	.35	.35	.34½	.34½	— .01½
Cottonseed Oil, bbl.	13.75	13.75	13.76	13.66	13.79	13.86	+ .11
Fish Oil, Menhaden, Brown, gal.	.74	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl.	.24	.24	.24	.24	.24	.24	...
Lard Oil, prime, gal.	1.55	1.55	1.55	1.55	1.55	1.55	...
Lead, 100 lb.	9.63	9.63	9.75	9.75	9.75	9.75	+ .12
Linseed Oil, gal.	1.00	1.00	1.00	1.00	1.00	1.00	...
Open-Hearth Steel, ton	70.00	70.00	70.00	70.00	70.00	70.00	...
Petroleum, bbl., Kans., crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.05	3.05	3.05	3.05	3.05	3.05	...
Rapeseed Oil, refined, gal.	1.05	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para, lb.	.77	.77	.76	.76	.76	.76	— .01
Rubber, Ceylon, First Latex, Crepe, lb.	.85½	.84	.82½	.82½	.82	.82	— .03½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	56.00	55.50	56.00	56.25	55.00	55.00	—1.00
Tire Scrap	.06½	.06½	.06½	.06½	.06½	.06½	...

Deppe Completes Financing

$1,050,000 Cash on Hand—To Build Car and Gas Generator

NEW YORK, March 24—The Deppe Motors Corp., which recently offered 100,000 shares of its stock to the public, announces that all of its stock, consisting of 500,000 shares, par $10, has been underwritten.

According to plans the company will build passenger cars embodying the inventions covered by the Deppe patents, and will take a stock interest in established truck, tractor, engine and aeroplane manufacturing concerns, which will incorporate the Deppe inventions in their products on a royalty basis.

The property of the Deppe corporation consists of $1,050,000 in cash and its patents, four of which have been granted, with a number of others pending.

The company was organized the early part of this year to manufacture the Deppe superheated gas generator and engines, under the various patents now held by W. P. Deppe, of New York. The Deppe generator is a device which by using a small part of the engine exhaust gases makes a superheated gas of all fuel oils.

The board of directors includes the following: W. P. Deppe; C. E. Parsons, of Parsons & Simpson, consulting engineers; N. D. Lancaster, director of the Howe Scale Co., formerly of R. A. Lancaster & Sons; M. O. Guiss, manufacturer of iron products, and R. B. Sperry, of Sperry & Co., investment securities, who is offering the 100,000 shares of stock to the public.

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NEW COMPANIES

ALBANY, N. Y., March 24—The Trego Motors Corp. has been formed to manufacture motors, aeroplanes and flying apparatus. The capitalization is $1,500,000 and the incorporators are Frank H. Trego, H. Bijur of 160 West 75th Street, New York, and H. H. Herts. Mr. Trego was formerly chief engineer of the Knox Motors Co. and of the Springfield Motors Co., of which he was works manager and a vice-president.

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FOND DU LAC, WIS., March 26—The Farm Tractor Co, has been organized at Fond du Lac, Wis., with a capital stock of $20,000 to manufacture a truck and tractor using the Ford chassis as a nucleus. The promoters of the new concern are associated with the Giddings & Lewis Mfg. Co., Fond du Lac, a large manufacturer of lathes and other machine tools and machinery. The production of the new machine will be carried on in the Giddings & Lewis plant, for the present at least.

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GENEVA, OHIO, March 23—The Geneva Tractor Co. will soon incorporate to build tractor attachments to Ford cars. All

that is necessary is to remove the rear wheels of the car and put in their place a steel pinion. This pinion engages an internal gear on the steel tractor wheels, reducing the speed to 3 m.p.h.

George Jacobs of Detroit is the designer and engineer. The incorporators of the company will include Mr. Jacobs, A. W. Chamberlin, G. C. Webster and A. M. Ford. Messrs. Chamberlin, Webster and Ford are president, secretary and treasurer, respectively, of the Geneva Metal Wheel Co., which will manufacture the tractor attachment.

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BUFFALO, N. Y., March 22—The Empire Auto Trailer Co. has been incorporated with a capital stock of $50,000 to manufacture motors, machines and accessories. C. B. Howell, Frederick Tucker and Joseph Kazubowski are the incorporators.

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YPSILANTI, MICH., March 27—The Michigan Crown Fender Co. has been incorporated for $200,000.

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GRAND RAPIDS, MICH., March 27—The Michigan Tire & Accessories Co. has been formed with a capital of $100,000.

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CHAMPAIGN, ILL., March 24 — The Cushman Auto Tool Co. has been incorporated, with capital stock of $150,000. The incorporators are: G. M. Cushman, M. G. Cushman and B. E. Shaw. A site is now being sought to manufacture tools for automobiles.

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CLEVELAND, March 26—The Forster Mfg. Co. has been incorporated for $30,000 to manufacture automobile accessories. The incorporators include S. Newell, E. Angelis, W. L. Fleming, A. P. Martin and C. C. Owens.

Security Prices Are Lower

Goodyear Common Strong with 20-Point Rise — Rest of Issues Weak

NEW YORK, March 28—With the exception of a 20-point rise on Goodyear common, last week's security activities were dull and weak. There was little demand for this class of stock, probably on account of the uncertainty manifest in the other industrials. The war situation at present is responsible for the holding ack of prospective buyers and for much unloading of stock. A majority of the holders are uncertain just what the trend of automobile issues will be if war is declared, and as a result this market is inactive. On the other hand, there is a certain class of buyers, which is waiting for prices to drop, and then will come in for large purchases. This class is of a more optimistic feeling in regard to the future.

Declines last week ranged from a fraction to 30 points, Miller Rubber common featuring the latter. Chevrolet dropped 15 points after a gain of 23 points the previous week. General Motors was weak at 118, a loss of 3½ points.

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Detroiter Motors Offers Stock to the Public

DETROIT, March 23—The stock of the Detroiter Motors Co. is being offered to the public through investment brokers. This is the concern which has taken over the going business of the Detroiter Motor Car Co., the United Detroiter Co. and the Detroiter Motors Corp. The 8 per cent preferred stock, par value $10, is offered with the privilege of subscribing an equal amount of common stock, par value $10, at $1 per share. The company has profits for the fiscal year of 1916 of $175,238.05. The annual dividend requirements of the preferred issue authorized to be sold ($500,000) is $40,000. The company estimates its earnings for 1917 under production of 3000 cars at $518,000.

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Columbia Motors Offers Stock

DETROIT, March 22—The Columbia Motor Car Co. is offering $150,000 of its stock to the public through investment. The company has an authorized capital stock of $500,000. $250,000 has been issued besides the present $150,000 issue and $100,00 worth will be held in the treasury. The company is now shipping cars and a daily output is promised for the near future.

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1916 Record Year for Electric Storage Battery

PHILADELPHIA, March 23—The Electric Storage Battery Co. reports that 1916 was its largest year in point of earnings. Profits amounted to $2,069,977, compared with $1,770,188 in 1915. The 1916 profits were affected by the higher costs of materials. As it was the total manufacturing profit for the first time exceeded $2,000,000. Indirectly the company has benefited by the European war. The surplus this year was the highest in the history of the company, amounting to $932,089, as compared with $710,583 in 1915.

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	67½	69	— ½
*J. I. Case T. M. Co. pfd.	81	88	—1
Chalmers Motor Co. com.	24	30	—1
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	101	103	—2
Chevrolet Motor Co.	125	130	—15
Fisher Body Corp. com.	35	40	..
Fisher Body Corp. pfd.	94	96	..
Fisk Rubber Co. com.	65	75	..
Fisk Rubber Co. 1st pfd.	101	105	..
Fisk Rubber Co. 2d pfd.	70	100	..
Firestone Tire & Rubber Co. com.	141	143½	—1
Firestone Tire & Rubber Co. pfd.	107	109	.. ¼
*General Motors Co. com.	118	118¾	—3½
*General Motors Co. pfd.	90½	91	..
*B. F. Goodrich Co. com.	55⅜	56	— ⅝
*B. F. Goodrich Co. pfd.	108¾	112	—1¾
Goodyear Tire & Rubber Co. com.	250	255	+20
Goodyear Tire & Rubber Co. pfd.	106	107	—7¼
Grant Motor Car Corp.	6	8	+1
Hupp Motor Car Corp. com.	4	5	..
Hupp Motor Car Corp. pfd.	85	90	..
International Motor Co. com.	..	16	..
International Motor Co. 1st pfd.	..	70	..
International Motor Co. 2d pfd.	..	30	..
*Kelly-Springfield Tire Co. com.	63	63½	+3
*Kelly-Springfield Tire Co. 1st pfd.	93	94	..
*Lee Rubber & Tire Corp.	22½	23¼	+ ⅛
*Maxwell Motor Co., Inc., com.	52¼	52½	—3¼
*Maxwell Motor Co., Inc., 1st pfd.	66¾	71	—4½
*Maxwell Motor Co., Inc., 2d pfd.	33	33½	—1½
Miller Rubber Co. com.	230	240	—30
Miller Rubber Co. pfd.	105	†106	..
Packard Motor Car Co. com.	..	163	..
Packard Motor Car Co. pfd.	..	101	..
Paige-Detroit Motor Car Co.	36¼	37¼	—1¼
Peerless Truck & Motor Corp.	14	16	—1
Portage Rubber Co. com.	179	182	—5
Portage Rubber Co. pfd.	..	..	..
Regal Motor Car Co. pfd.	21	25½	+2
Reo Motor Car Co.	34½	35½	—1
*Saxon Motor Car Corp.	57¼	58	..
Springfield Body Corp. com.	70	80	..
Springfield Body Corp. pfd.	110	120	..
Standard Motor Construction Co.	9	12	..
*Stewart-Warner Speed. Corp.	81½	82½	+1
*Studebaker Corp. com.	101½	102½	—3⅛
*Studebaker Corp. pfd.	105	107	— ½
Swinehart Tire & Rubber Co.	78½	83	—5½
United Motors Corp.	38¼	38¾	—2¼
*U. S. Rubber Co. com.	59	59½	—2
*U. S. Rubber Co. pfd.	108	108¼	+ ¾
*White Motor Co.	49	50	— ½
*Willys-Overland Co. com.	33¼	33½	—1¼
*Willys-Overland Co. pfd.	97	99	—1¼

*At close March 26, 1917. Listed New York Stock Exchange.
†Ex. dividend.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	33	..
Chalmers Motor Co. com.	..	..	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Co. com.	7¼	7¾	— ¼
Continental Motor Co. pfd. (new)	98	99	..
Ford Motor Co. of Canada	295	325	+20
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	..	51½	..
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Packard Motor Car Co. com.	..	165	..
Packard Motor Car Co. pfd.	..	101	..
Paige-Detroit Motor Car Co.	36½	37¾	..
W. K. Prudden Co.	28¼	29¾	..
Reo Motor Car Co.	34½	35	+1⅜
Studebaker Corp. com.	102½	105	+ ½
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	..	27	..

INACTIVE STOCKS

Atlas Drop Forge Co.	..	..	..
Kelsey Wheel Co.	..	..	..
Regal Motor Car Co.	..	26½	..

Chalmers Six in Non Stop Run

Covers 96 Blocks in Chicago Loop in Hr. — 25 M. P. H. Average for 24 Hr.

CHICAGO, March 27 — A Chalmers seven-passenger 6-30 as a part of its 24-hr. non-motor-stop test under A. A. A. rules gridironed the Chicago loop this morning in 1 hr., which means that it covered the six streets running lengthwise in the loop and the eight cross streets, or ninety-six blocks, making thirty traffic stops in that time.

The car, with four passengers, started the test yesterday at 12.20 p. m. and was driven continuously through the parks and over the boulevard system and much of the time on streets having trolley tracks. When the car was brought to a halt at 12.20 to-day the speedometer showed 586.4 miles, or an average of slightly over 25 m.p.h. Both low and intermediate gears were removed from the gearset, which left only high and reverse, and the run was made on 42 gal. of gasoline, or at 14 m.p.g. Six quarts of oil were used and 2 gal., 3 pints of water.

The test was in charge of L. A. Hillman, A. A. A. representative, and two drivers worked in 8-hr shifts. Forty-seven minutes were lost in stops. The weight of the car, with four passengers, was 3815 lb. In a similar run in New York recently the mileage was 358.7.

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Plan Sheepshead Speedway Reorganization

NEW YORK, March 26—A new stage was reached in the financial difficulties of the Sheepshead Bay 2-mile motor speedway on Long Island when the Supreme Court in Brooklyn handed down a decision to-day ruling that the Sheepshead Bay Speedway Corp., is indebted to the Coney Island Jockey Club to the amount of $2,135,161.86, and granting to the club a judgment of foreclosure on the corporation's exhibition grounds at the old Sheepshead racetrack.

The Sheepshead Bay Speedway Corp. has at present a committee working along the line of financial reorganization and it is expected that the speedway will be continued as it has in the past. The sentiment is strong that New York can support a speedway. Contests up to the present have not been a financial success due to the very heavy overhead charges.

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No 1917 Races at Indianapolis

(*Continued from page* 625)

It is doubtful what influence the withdrawal of Indianapolis from speedway racing will have on other speedways. As soon as Indianapolis' decision to withdraw was known, the Chicago speedway and also the Cincinnati speedway applied to the American Automobile Assn. contest board, New York, for sanctions for Decoration Day races. It is expected that the contest board will oppose such a plan and rule that Decoration Day should not be given any speedway sanction.

David S. Reid, president of the Chicago Speedway Assn., expects that the racing program on the speedway will be carried out as usual this year. Manager Reid has wired the Secretary of War offering him the use of the Chicago speedway for military purposes should necessity arise. It is certain that many of the speedways would be very suitable for military purposes. At the outbreak of the European war the premier speedway of the world, the cement Brooklands track, was turned over as a testing ground for aviation and motor truck works.

The Cincinnati Speedway Co. expects to run its races of June 23 and Sept. 4, as scheduled some months ago, but H. S. Leyman, president, states the speedway will be turned over to the government if in any way it can be used by it. This speedway was built by the citizens of Cincinnati, much as a municipal enterprise. It cost $700,000, and every dollar has been paid.

The Pittsburgh Speedway Assn. states that the abandonment of the Indianapolis race will not interfere with its plans. It intends holding several events this year.

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U. S. Reserve at Goodrich Plant

AKRON, March 23—United States government officers have been in this city for 4 days. They have taken invoices and formed a reserve of 1000 men for the B. F. Goodrich Co. in the event of war with Germany. Head officials of the company state they have been sworn to secrecy concerning the government's plans.

The 1000 workmen have enlisted for 4 years' service in the factory at a maximum of 12 hr. per day. They will receive $1 a day from the government and in event of hostilities will receive full pay on a rating of present piece work prices.

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U. S. To Buy More Trucks

WASHINGTON, March 24—The calling out of additional militia units makes the purchase of additional trucks and other motor vehicles by the war department a probable step in the near future. No trucks have been purchased since the last installment put into service with the Pershing expedition and along the Mexican border.

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Chicago Has A. A. A. Representative

CHICAGO, March 24—Prominence of Chicago as a contest center is emphasized by the appointment this week of a special representative of the American Automobile Assn. contest board for this city. Chicago is the first city to have a special representative. L. R. Hillman, local branch manager of the Hess-Bright Mfg. Bearing Co., will serve in this capacity. In addition to being the general contest board representative in this city, Hillman also is the technical representative of the A. A. A. for the middle Western territory.

Racing Drivers in Aerial Unit

Rickenbacher Is Organizing a Squadron Composed of 25 of Leading Pilots

NEW YORK, March 26—Formation of an aerial squadron, to be composed of prominent automobile race drivers and their mechanics, was considered at yesterday's conference between Capt. W. G. Kilner, commanding the aviation field at Hempstead Plains, and E. V. Rickenbacher.

Under the plans proposed, the squadron would be composed of twelve aeroplanes and 133 men. Twenty-two automobile racing drivers and their mechanics have been invited to enlist.

If the squadron is formed it probably will be trained at Indianapolis, Detroit or New York.

Representatives of the Advisory Committee on Aeronautics, which is co-operating with Rear Admiral Usher of the Third Naval District, have just returned from Washington, where they conferred regarding a great aeronautic station in this city.

Rickenbacher is forming his squadron so that he may have some concrete backing to his plans when he goes down to Washington to get aeroplanes and supplies for his men. His idea is to go before the authorities and show them that he has a full-fledged unit, made up of men expert in automobile racing and perfectly suited to aeroplane work. As a unit formed with its own officers, he can go down to Washington and receive more attention, for with twenty-five of the leading racing drivers as aeroplane pilots banned together the Government is bound to get more service than if these men were split up in different sections of the country. Rickenbacher has so far received affirmative replies from Henderson, Chandler, Disbrow, Gregory Flynn of the Rajah company, and Ralph De Palma. The drivers will be under the instruction of DeLloyd Thompson, the prominent aviator.

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A. A. A. Census Finds Racing Drivers Ready for War

NEW YORK, March 27—Over 300 replies have been received to date by Chairman Kennerdell, of the A. A. A. Contest Board, in his census of registered racing drivers and mechanicians available for military service in case of war. On Feb. 19 Mr. Kennerdell sent a letter to each registered driver and mechanician, pointing out the necessity for preparations to join the United States service in the event of war, and enclosing a blank to be filled out, by a statement of preference as to service in the aviation corps or as driver of a military car. The drivers and mechanicians were equally divided between these two fields of activity, according to the replies on the blank.

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Truck Engineering

READING through the automobile engineering literature of the past decade, including periodical publications and society papers, it is remarkable that we have so much more about the passenger car than the truck. The problems of truck design are essentially different in many ways, and there are many men who have made the truck an especial study. Thus it is the more remarkable that truck engineering has not received more *concentrated* attention.

Poor Discussion of Good Papers

From time to time the S. A. E. has been criticised for not having more discussions on truck subjects, yet it is a fact that when good papers have been staged the discussion has been poor, with certain few exceptions of course. Why is this? Are the truck men less imbued with the get-together spirit, or are those men who really know less willing to talk?

The work done by the truck standards division of the society during 1916, both independently and in conjunction with the War College, on military truck specifications showed that there are a thousand problems of truck construction which are different from passenger car questions; yet these are seldom heard of outside the committee room. It is not good for the industry that this should be so. Up to now the passenger car trade has been bigger, but it would not be fair to say that this made it more important. Trucks and tractors may, in the end, have a far greater effect on the life of civilized countries than passenger machines.

We Need More Truck Discussion

THE AUTOMOBILE has opened its columns to many a discussion; most of them have been on passenger car matters, and to a few relating to trucks and tractors. We want more of the latter. On the other side of the Atlantic truck engineering has taken its proper place, owing to the forced attention upon it brought by war, and Europe will have far better trucks after the war because of the prominence thus given to truck problems. America's truck production has meanwhile increased very much but the great growth of passenger car business has overshadowed it. Our truck engineers are too modest; let us hear from them more often.

Quantity Production

IN 20 years, when some student of manufacturing comes to look back over the early years of the twentieth century, he will see that the automobile industry has been one of the most powerful factors in developing the science of economical manufacturing. This is because the automobile is far the most complex thing that the world has ever produced in quantities, although it may not always hold this position.

To-day it seems likely, in fact a stronger word might be used, that we shall soon see the production of fair-sized ships on a repetition basis. Submarines have certainly been built this way; tank ships are likely to be the next to follow, and in restoring the devastated parts of Europe we shall see standardized bridge and railway units which can be assembled to suit conditions.

We are within easy sight of the standardized apartment house with standard plumbing, lighting and other fittings; the erection of a series of standard hotels in France has already been discussed in public.

To claim that all these developments are due to the example of the automobile industry would be absurd, but it is not absurd to say that the automobile was the instigator of the ideas. The first quantity produced machines with any degree of complexity were probably the rifle and the typewriter, but it was a far greater stride of imagination to go from these to the automobile than it is to move from the latter to the other structures mentioned.

Always Tackling New Problems

The newest industry often attracts many among the brightest brains of the age, and all over the world there is no question but that the automobile industry has had in its ranks many more progressive individuals than any other trade. Its engineers, its business managers, its factory supervisors have had to tackle new problems, and keep on tackling them. No doubt it is the rapidly changing conditions they have had to face which have kept their minds so agile.

Plant Units Make Efficiency

Six Sections, Each Complete, Form Perfection Spring Plant—Great Economies of Space and Cost Obtained From New Organization—Elasticity of Output Without Affecting Cost

By A. Ludlow Clayden

THE making of springs is so specialized a business that the organization of a factory for their production must necessarily be peculiar. The system in use at the plant of the Perfection Spring Co., Cleveland, has been worked out over a period of years and has been applied bit by bit. It is now practically complete and is working in a very satisfactory manner. The system might be applied to other things than springs, but the reason for the particular organization adopted is the production of numerous, successive short runs on each order. That is to say the Perfection company is normally making about 2000 different springs. The consumers will want different deliveries, but it is rarely possible to tool up for one spring and run off the whole order. Instead, the daily or weekly quota has to be made, and then a change over to another order for its quota. It seems likely that any other article which has to be produced in a similar way could be handled according to the same general principles.

Three Main Sections

There are essentially three sections of the factory. The first is the raw material stock where the requisite lengths of steel of different sizes are cut off and stacked in lots. The second is the manufacturing section where the spring is made. The third is the finished parts stock which handles such things as rebound clips, spring eye bushings, etc., sorting them for each lot and supplying the manufacturing section in just the same way as the bar stock is supplied.

The details of the first and third departments are not abnormal. Their duplicates in system can be found in any well-organized plant, but the manufacturing section is highly original. Housed under one roof, it is divided into six sections, each complete in itself and containing everything necessary for the making of a spring. This subdivision permits the manufacture of one spring at a time in a section and the detail within the section is arranged so that it is possible to operate continuously without any appreciable loss of time for changing over from one spring to another at the end of a "lot."

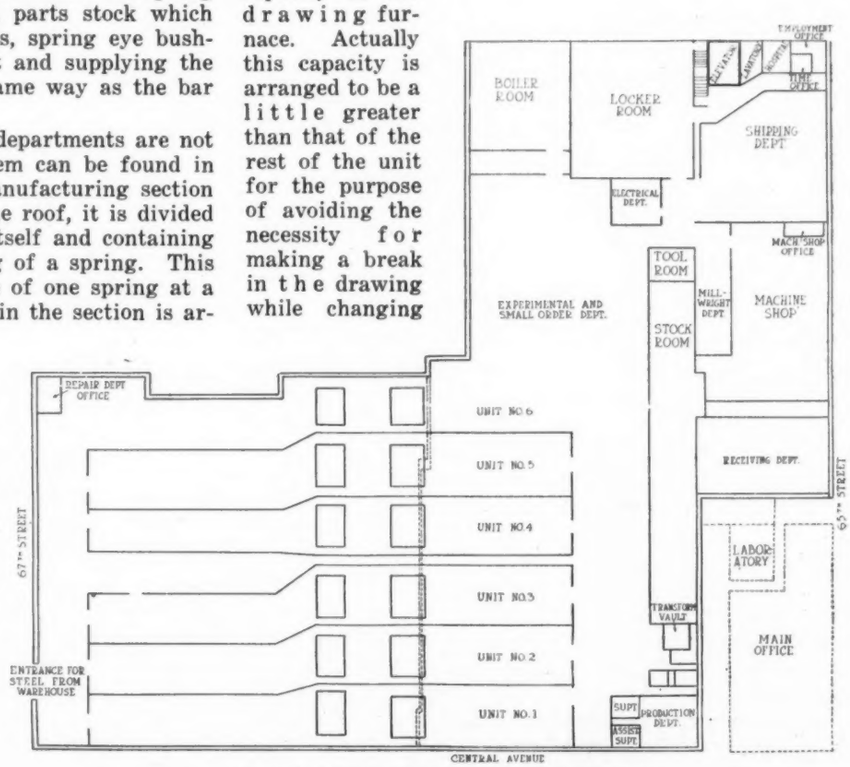
Before going into detail a few of the more prominent advantages of the system of units or sections may be mentioned. First it eliminates the possibility of confusion. For 6 hr. a day, or even more, there will be only one spring going through one section. There will be no material and no fittings within that section suitable for anything else except that one spring. If the steel is a special quality, needing a special heat treatment, the furnace controller has only to keep his pyrometer readings checked at one correct point; he is not reading first a carbon steel furnace which should be at one degree, and the next instant a chrome steel furnace with another correct temperature.

Second, the assembling is carried out on a table just large enough to maintain the speed with which the finished spring leaves can be fed to it. It is practically a one-man, one-job assembly and it is easy to keep the progression smooth without accumulations.

Furnace the Speed Limit

Third, the six sections permit as many springs to be made simultaneously without as much movement as would be necessary did all the different leaves have to pass through a centralized heat-treating department and then be redistributed to sectional assembling tables, and to assemble more than one spring at a time with the same gang would not be possible.

In all manufacturing there is some process that is the slowest, and in spring making this is the "drawing" or heat treatment of the spring leaves after they are brought to shape. It is the last big operation on the leaves individually and is followed by assembly only. Thus the capacity of any unit in the plant is measurable by the capacity of the drawing furnace. Actually this capacity is arranged to be a little greater than that of the rest of the unit for the purpose of avoiding the necessity for making a break in the drawing while changing



Layout of Perfection plant, showing six units

over the tools, etc., in going from one spring to the next. It has been found possible so to balance the capacity of the furnace against that of the other parts that there will be an excess output from it, just large enough to keep the assemblers busy till the next series is coming through after a change from one lot to the next. Of course, time is left for changing the stock of small parts in the assemblers' bins, but this is a matter of minutes only as everything is got ready for the next lot before the preceding one is run off.

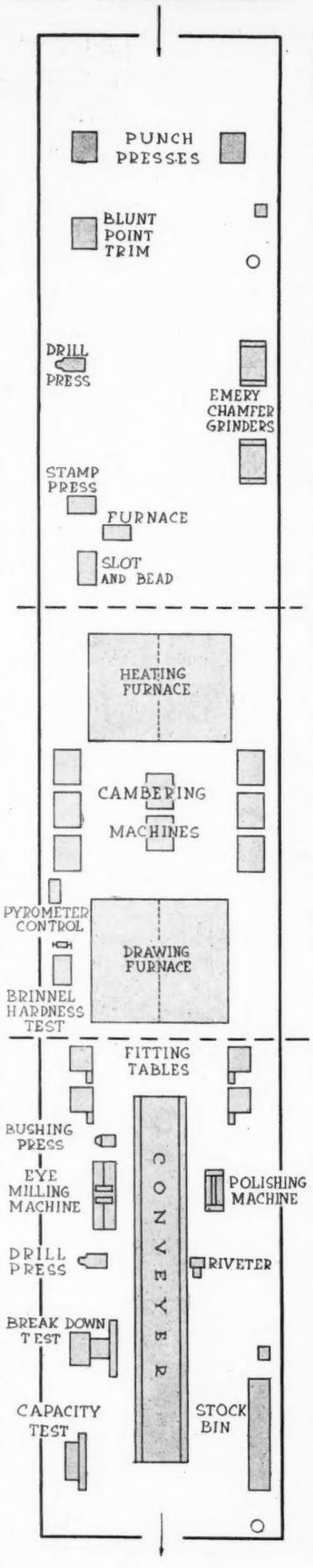
Sufficient has been said to show the general scheme of the unit system of manufacture in the Perfection plant; we may now proceed to greater detail. Following the procedure after an order is accepted; after going through the hands of the credit department it goes to the order department for scheduling and then to the engineering department, which attaches a blue print or prints. This is really preliminary work, office work rather than factory. The next to get the order is the production department.

Production Department Controls System

The production department issues three orders. One to the steel warehouse to deliver a specified quantity of raw material cut into specified lengths to Unit No. X at — o'clock on such and such a day. The second order goes to a department which cares for the tools used in the units which have to be changed as the spring being made is changed. This department is instructed to have the complete set-up ready at a time in advance of the time when the raw material will be delivered to the unit. The third order goes to the small parts stock room, which is instructed to deliver all the bushings, rebound clips, spring bolts, etc. All these deliveries will be made a short time before the unit should have finished the previous run. At the same time a card is sent to the foreman of the unit concerned so that he knows what to expect, but he has no official part to play in getting his material or tools. At the completion of the lot the foreman's card returns to the production department, the unit's cost card for the job going to the cost department direct.

Work in Warehouse

Naturally, seeing that springs for everything from the lightest car to the heaviest truck are made, it is necessary to carry a large stock of steel, and this necessity is increased by different customers wanting different qualities of steel. The price of a spring varies from almost 1 to 4, according to the material. The warehouse is a new building 380 ft. by 104 ft., with a shipping bay in one corner and a traveling crane which stacks the bars into heaps along each side. Centrally is a narrow rail track on which the



electrically operated cutting-off machines are traversed, so as to work as close as possible to the stack of bar required for the order in hand.

In the end of the warehouse nearest the exit door is the eye-forming plant where the spring eyes are rolled on the ends of the top leaves. The object of doing this before sending the stock to the unit is twofold. First, the machines used are large and occupy a great deal of space, and secondly, there is not very much variation in the size of the spring eye, this being one of the most nearly standardized portions of a spring. This means that there is less changing over to be done on the eye formers than there is on most of the machines used within the units.

As each load of stock is collected it is placed on a trestle with legs, and to move the load a small electric truck is run under the trestle, lifts it off the ground, takes it to the entrance gate of the unit to which it is consigned and there leaves it. At present the steel has to be taken across and a little way along a street in going from warehouse to unit, but eventually there will be underground communication.

Meanwhile, the tools for the order are placed on racks and delivered inside the unit, also the small parts, sorted into steel bins ready to take their place on the assembly line.

Three Stages in Unit

The six units are arranged in a line, inclosed completely and separated by high fences of wire net. There is a gate at each end, but no other means of ingress. The steel is delivered to one end, the small parts to the other.

Within the unit there are three zones. First come operations on the steel before it is cambered. Second come heating in the first fire, cambering and drawing, or heat treatment. Third is the assembling. The cambering machines stand between the two furnaces and occupy about the middle of the length of the unit, the furnaces being as close together as is practicable.

The detail operations can be divided generally as above and then more minutely, but before going into the smaller detail some idea of the speed may be given, and of the capacity of a unit. The schedule calls for a production of about 5000 complete springs a day, working three shifts and 24 hr. This give each of the six units an average allotment of just over 800 springs per day, or one spring each 1.8 min. Allowing for changing shifts, etc., this means a working speed averaging about 1½ min. per spring.

To pass through the unit the spring takes about 2 hr., that is to say, the times taken for each operation add up to this, considerably over 1 hr. out of the

2 being the heat treatment in the drawing furnace. Of course there is some variation, according to the size and nature of the spring, the most important factor being the number of leaves.

The detail operations within the unit follow:

ZONE 1.

1. Punch center hole for bolt in all leaves and holes for rebound clip attachment in one leaf.
2. Countersink for heads of rebound clip rivets.
3. Trim ends of all leaves except top leaf, bringing them to the diamond-shaped point used for all Perfection springs.
4. Chamfer, or remove burrs due to previous operations.
5. Stamp short plate with distinguishing marks which identify it for the rest of its life.

ZONE 2.

6. First heat at approximately 1700 deg. Fahr. to bring plates to condition for cambering.
7. Camber in battery of six machines set up with sufficient dies apiece to care for all the leaves of the spring.
8. Draw or heat treat.

ZONE 3.

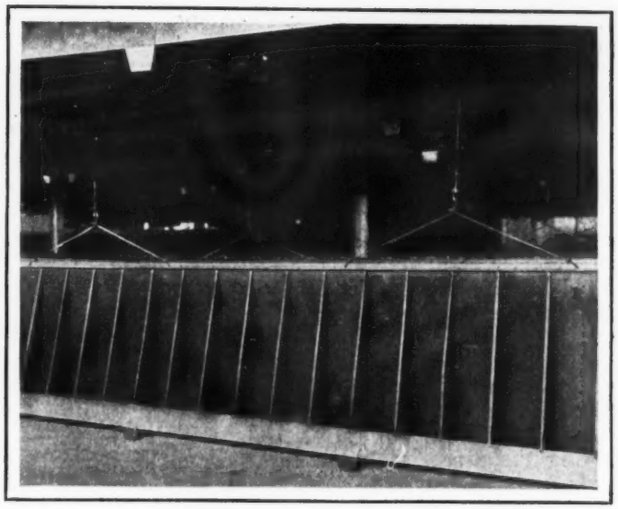
9. Peening; hand hammering to correct any warp which remains after drawing. Many plates do not have to be corrected and the idea is to eliminate this process.
10. Remove scale by grinding.
11. Insert bushings.
12. Ream bushings.
13. Grind sides of eye and bushing to bring to exact size.
14. Attach rebound clips to plate which carries them.
15. Paint with graphite.
16. Assemble on center bolt.
17. Breakdown test to see that spring returns to proper place after compression, and capacity test to check deflection with load.
18. Inspection.
19. Put bolts in rebound clips. (This is not done till after inspection, in case the spring might have have to come apart again.)
20. Insert patent liner in bushing.
21. Paint. (This is not an invariable operation, as only some customers require the springs to be painted before shipping.)

In Zone 3 the whole of the operations are carried out on opposite sides of a conveyor table. The spring in its progress moves from side to side, taking a zigzag course, as this economizes space within the unit. The conveyor is mainly useful in that it is a facile way of moving the spring parts from man to man; it does not control the speed of assembly in the rigid way that a chain conveyor controls the speed of chassis erection.

It is in the second zone that the most delicate work is done, a very important point being the control of the furnace temperatures. Originally, before the installation of the unit system, all furnace temperatures were read at a distance, recorded in a room in the office, and the foreman of the furnaces advised by telautograph as to the condition of each of the furnaces in his charge. With the unit system this is abolished. Instead, each unit has a heat regulator who reads the pyrometer and handles the firing. There is also need for making frequent hardness tests, and each unit has a Brinell machine alongside the drawing furnace. Neither temperature, nor hardness testing is, however, under the control of the unit foreman.

Labor Organization

The labor organization is not less interesting than factory layout, and embodies some novel ideas. First there



Method of suspending men's lockers used in Perfection plant

are three shifts, working 6.30 a. m. till 2.30 p. m.; 2.30 p. m. till 10.30 p. m., and 10.30 p. m. till 6.30 a. m. These hours are so arranged that the men come and go at times when other factories are either at work or closed, which greatly assists in preventing street car congestion, and has other advanages which the men in general appreciate. For one thing, if they have purchases to make the stores are less full than at times when the men from other plants are coming out. The shifts are rotated so that a man works in one a week, then in the next a week and then in the third a week. This means that a man only loses his night for sleeping one week out of three, and so does not get tired out with continual night work. The plant closes down at 10.30 p. m. on Saturday and opens again 6.30 Monday morning, so every man gets a complete rest over Sunday, and the shifts can be changed without any difficulty.

Each shift is organized roughly as follows: First is the superintendent of the shift under whom are the six foremen of the six units. There are about thirty men in each unit under the foreman.

Also in each unit are the inspectors and the men responsible for heat regulation and Brinell harnness testing, but these men are not under the unit foremen. Instead, the inspectors are responsible to the "shift foreman of inspection," who oversees all the units, and the heat and hardness men are responsible to the "head inspector of heat and hardness," this department being controlled direct from the engineering department of the office.

A further refinement of the rotating shift system is that the inspection and the heat and hardness men rotate one way and the rest of the men the other way. This means that no operating shift has the same inspection shift for more than a week at a time. This is found to make for peace within the plant since it does away with the possibility of forming gangs or cliques which are usually bad for the esprit de corps of a factory. No individual man knows just where he will be working next week.

Scheme Highly Successful

Some idea of the success of the unit system of manufacture is obtained when it is learned that the output has been increased 500 per cent in 2 years without the addition of any floorspace except the steel warehouse. There is a portion of the factory devoted to making sample springs and very small orders in the old way by hand

from which the output is negligible, and this occupies almost as much space as the six units. Another advantage of the unit system is that it is possible to close down one or more units if the plant is slack, without affecting the efficiency of any of the others. As an example of how this works it is stated that a variation of 100 per cent on an order within a month does not affect the cost per piece. It is, of course, part of the scheme to have the capacity of the units sufficiently greater than the volume of business to permit occasional closing down of one unit at a time for overhaul of its equipment, although running repairs are carried out on Sundays.

The laboratory, in a separate building, the hospital, the men's moving-picture theater and lunch rooms, etc., have all been described before, and a consideration of them does not really belong to the present article, but one recent improvement deserves mention as an ingenious space saver. This is the men's locker room where there are 1800 lockers wanted 600 at a time. Instead of the usual sort of closet with a door, there is an open steel receptacle for each man, and the racks of these completely fill the floor of the locker room. All the racks, however, are suspended from the roof by cables, so that each or all can be hoisted up out of reach. As each shift comes into the locker room the racks corresponding are let down, being hoisted up again as soon as the room is clear once more, thus there are always two-thirds of the lockers up in the roof and only one-third at a time on the ground.

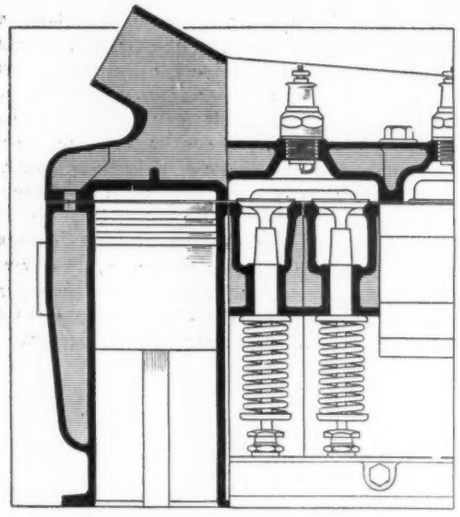
Two New Types of Tanks

First Photographs of Caterpillar Design for U. S. Army and a French Construction

AT the right is illustrated one of the caterpillar tractor armored cars of the tank variety, which has just been completed. The machine is undergoing demonstration tests before a board of the United States army officers at Los Angeles, Cal. The construction, as will be noted, is somewhat similar to that of the famous British tanks, which have been so widely used on the front in the North of France. Note the wire cutting blade carried in front of the turret.

Photographs by International Film Service, Inc.

AT the left appears the first photograph taken of one of the new caterpillar tractor armored cars, which are now being produced in French factories for the use of the French army. This machine resembles a boat construction much more than the familiar British tank and differs still more widely from the United States army machine illustrated above. Note the peculiar style of wire cutter mounted at the front of the French machine.



Well-known car engine, with detachable head, showing spark plug cooling

Improving Design of Waterjackets

Experiences in Tractor Cooling Indicate Possibilities of Better Proportioning of Jackets and Core Work of Automobile Cylinder Castings

By J. Edward Schipper

IT has remained for the experiences found in the tractor field to clearly show the way to waterjacket improvement. It is impossible to use ordinary touring car cooling practice in the tractor engines and have them stand up any length of time. The cooling arrangements of a tractor engine must be much more carefully worked out. But because the stresses are more severe, and because these tests have shown where the weak spots are, there is good reason to take advantage of them and apply the lessons to ordinary passenger car design.

In going over the most necessary elements of design in tractor engines in a paper* recently presented before the Society of Automobile Engineers some specific points enumerated were:

1—A careful layout of the combustion chamber in order to secure a high uniform temperature of the walls; thus means no pockets for steam in the jacket, and a correct direction of cooling water flow.

2—Valves arranged to secure favorable heat flow in the exhausts toward the waterjacketed seat and valve guide.

3—Piston head cooled so as to keep the temperature of its center below the cracking point of the fuel.

4—Efficient circulation of the water about the spark plugs.

It will be noted that these four points which were the first to be mentioned all hinge upon the proper proportioning of the jackets and core work of the cylinder casting. Where the stresses on the engine are as severe as they are in tractor service it is naturally to be expected that weaknesses in any of the above points will have very deleterious effects on the service the tractor is able to render. In the passenger car engine these points will not be shown up as quickly, but they certainly have to do with the life and performance of the engine and therefore must be studied.

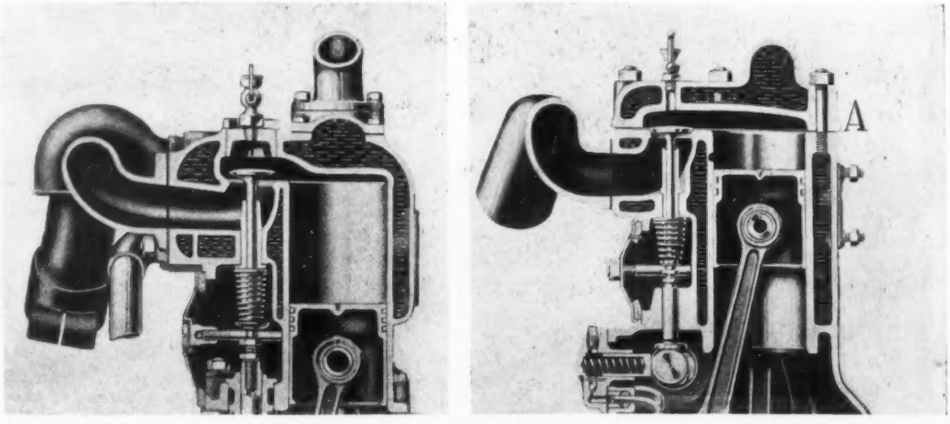
Cooling Losses 40 per Cent

With the heat losses to the cooling water ranging in value according to recent tests from 25 to 40 per cent of the total calorific value of the fuel, the matter of ratio between the superficial wall surface and the combustion chamber volume becomes of considerable importance. The heat losses are shown in the diagrams herewith which have been taken from a paper entitled Heat Balance Tests of Automobile Engines, by Walter Fishleigh and W. E. Lay. They clearly bring out the small amount of heat energy that is available for useful work and the necessity for going the limit in making the combustion chamber as efficient as possible. Still, with all the desire to retain the heat, it is necessary to carry it away from certain parts with more care than is being generally put into this class of work.

Plugs Frequently Blamed Unjustly

The waterjacket spaces around the spark plugs and around the valve stems are probably the parts that suffer most. The owner of the car will naturally blame persistent spark plug troubles on the plugs, whereas in reality the part to be blamed is the waterjacket arrangement which fails to carry the heat away from the plug.

Steam pockets in the waterjackets are danger points. They are caused by a decrease in the area of the jacket at points which cause a constricted passage in the water flow. In L-head engines the points where they are most apt to occur are around the valve stems and over the combustion chamber at the point of curvature of the cylinder. It must be re-



Two prominent stock passenger car engines in end sectional view, showing arrangement of waterjacket around the combustion chamber and valve stems and illustrating variations in practice regarding the depth in which the water is carried in relation to the stroke. Note the amount of metal necessary to take care of the studs securing the detachable head of the engine at the right as illustrated at A

*H. L. Horning, on the Ultimate Type of Tractor Engine.

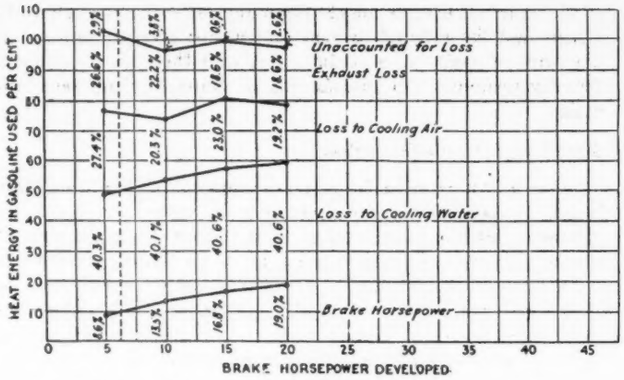


Fig. 1—Results from heat balance tests of engine at 640 r.p.m. (car speed 18 m.p.h.)

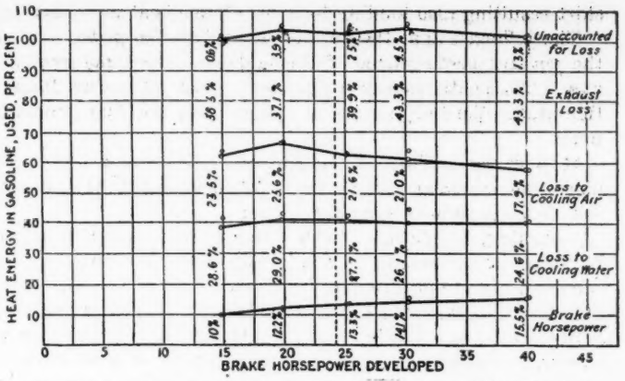


Fig. 3—Results from heat balance tests of engine at 1350 r.p.m. (car speed 39 m.p.h.)

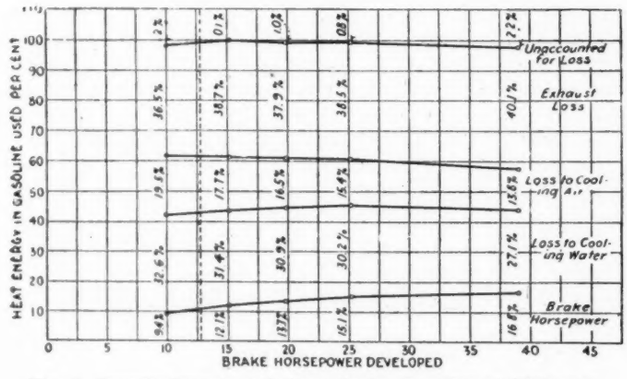


Fig. 2—Results from heat balance tests of engine at 1000 r.p.m. (car speed 28 m.p.h.)

membered that it takes a free flow of water to carry the heat away from corners. This means easy curvatures and with all curves in the direct course of water flow. Some engine manufacturers secure these conditions by a careful baffling arrangement but in all cases it must be remembered that the proper flow of the water is *toward* the hottest section.

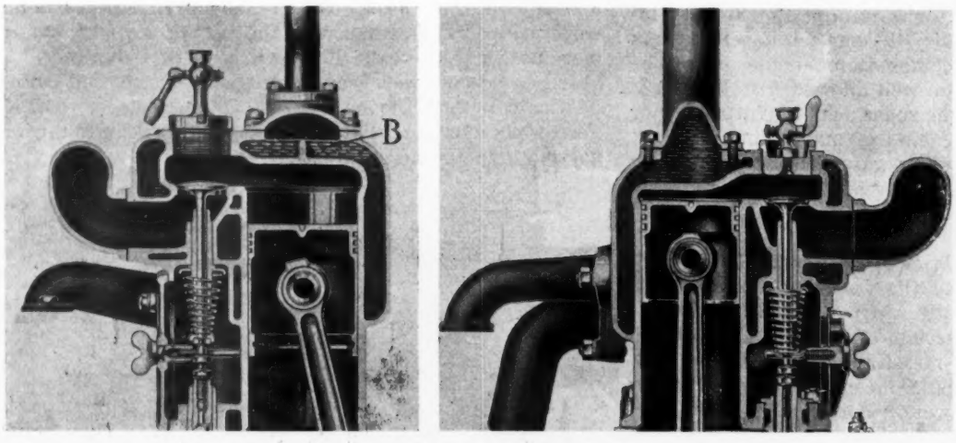
Basic Law of Cooling

The ideal condition is a uniform temperature for the walls. The flow of heat through a cylinder wall varies directly as the difference in temperature between the jacket and the wall and also as the rapidity of renewal of the cooling medium. These are the two basic laws by which the design of the jacket is governed. Therefore, it is necessary to have water at a fair temperature around threatened points where areas of uncooled metal are apt to occur and it is also necessary to have this water rapidly renewed.

One of the greatest difficulties with the detachable cylinder head engine is to keep the cylinder head properly cooled. A majority of those who adopted this style of engine a year or two ago have had to change their water layouts in order to get the necessary amount of heat removed from the head. Naturally, there is more metal to cool on account of the necessity for sufficient material to take care of the studs which hold the head in place. The copper-asbestos gasket also acts as a heat insulator from the rest of the casting and cuts off the heat travel to the cooler part of the engine and also the exhaust gases pass through the head, assisting heating.

A large number of water holes is necessary and these holes should be as large as is compatible with good design. On an engine of 3½ in. bore, the total area of the water passage should be about the size of a 3-in. pipe on an engine of conservative design. The more holes for the jacketing around the head, the more complicated is the gasket and the more danger of having an internal water leak into the combustion chamber. Care must be used in the layout, but a little more water than necessary is better than a little less.

One of the best arguments in favor of long pistons is the ability to carry the heat away from the piston head. With the small bore engines little trouble is had in this direction. With the present tendency toward light weight, however, it is necessary to be careful when the bore approaches 4 in. The center of the piston is likely to have a hot spot. Attention is called in Mr. Horning's paper on tractor engines to the fact that the piston center must have a temperature below the cracking point of fuel. A piston with a good system of internal ribbing can be made strong as well as light. In tractor practice naturally the pistons run far heavier than they do in passenger cars. The cast iron pistons, though, can be made far lighter than was at one time believed possible, but in lightening them the center circle is the danger point from which the heat must be carried. The weight gained by the added ribs can be saved by milling the piston skirt, the thinner



At the left is an end section of a four-cylinder block engine adaptable to commercial vehicle use showing arrangement of waterjacket spaces with the baffling plate at B. At the right is a prominent stock automobile engine in end section, showing another variation in practice regarding the side waterjacket depth and arrangement arou nd the combustion chamber from the two engines illustrated at the bottom of the opposite page

skirt resulting also tending to carry off the heat more readily.

The influence that the hot center spot of the piston has on the general performance of the engine is often not appreciated. The heated center is the direct cause of carbon formation where the temperature is higher than the fuel cracking point.

If it is above the fuel cracking point it is also apt to be above the cracking point of the lubricant and then one of the direct causes of gummed piston rings.

Regarding circulation of the water about the spark plugs the point is so obvious that it hardly needs explanation. A leaf from the racing car note book can be taken on this. The The chronic spark plug failures of 2 and 3 years back on the racing track were finally traced to the cooling system after a vain search had been made for basic defects in plug design. It is of course true that the racing plugs have improved in that time but the best reason for better plug performance is in the fact that the cooling water is now being carried faster around the thinner metal wall through which the plug is carried into the cylinder.

With passenger car practice, in which the requirements are far less severe, it takes a longer time for the defects of the cooling system to be shown up. Sooted plugs, short-lived electrodes and general unsatisfactory ignition can be frequently traced down to improper water circulation around this point. A mass of metal located above the combustion chamber at the point where the spark plugs and pet-cocks are generally placed will be difficult to cool under any circumstances. If the wall of metal here is too thick and the water is not led directly around it the results can be found in poor performance.

Side Waterjackets Important

In block cast engines there is a tendency to skimp the waterjacket space between the cylinders in order to obtain the shortest possible crankshaft. The latter is desirable, of course, but all the rigidity should not be gained at the expense of the waterjacket area. In engines where this has been increased a direct benefit has been found. The side waterjackets are the ones which have the greatest influence on the lubrication of the cylinder walls. Here the temperature must be kept uniform as well as over the combustion space. There is an advantage that the water is cooler at this point and hence the temperature difference is greater and the flow of heat naturally more rapid.

Some makers are extending the jacket lower this year than they have in the past. It should be carried a little below the bottom of the stroke in order to eliminate a pocket which has a tendency to become hot. A steam pocket at the bottom of the jacket shuts off the circulation completely and is a very possible occurrence if the water is not baffled so as to be carried in full flow all around the cylinder wall.

Combustion Chamber Design Study

Cylinders Should Be Laid Out from Combustion Chamber Outward, with Exterior Last Consideration

IN view of the fact that volumetric efficiency must be sacrificed, due to preheating the incoming charge, every possible gain that can be made by an efficient combustion chamber should be taken. Conditions are ideal when the top face of the piston at the top of its stroke forms the base of a hemisphere making up the combustion chamber.

Although the ideal is probably unobtainable even by the best design of overhead valve chambers, still there is no question but that this hemisphere could be approached to a much closer degree by a rearrangement of the cylinder casting in a great many instances. Designers have been in the habit of working from the L-shaped cylinder casting inward toward the combustion chamber. Owing to the growing importance of obtaining the highest internal efficiency in this part of the engine, it would seem advisable to work from the combustion chamber out. The exterior of the engine can be well allowed to follow as it will or be accommodated to the space desired if the interior measures up to the requirements of maximum efficiency.

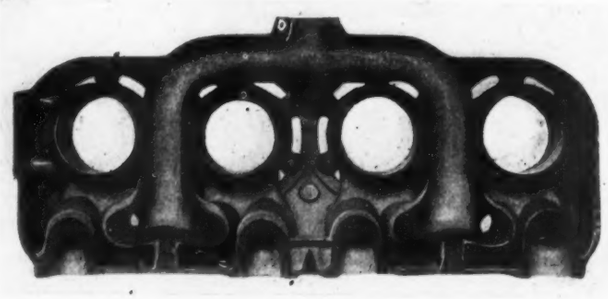
Probably the most interesting way of studying this development of combustion chamber and port design is by taking the sawed-through sections of that part of the cylinder. Such a section is shown in the accompanying illustration, this being the top of a four-cylinder truck engine which is featured by the fact that it has single detachable heads, each head being detachable independently. By studying a section of this kind, the two sweeps of the ports can be noted and improved if necessary. It will also serve as a means for reducing the amount of metal at points where hot spots are likely to occur and where they are not desired.

After all, there are two main objects in proper combustion chamber and port design. The first object is to secure as near as possible a complete filling of the cylinder, and the second object is to secure the greatest amount of effort on the piston head from the explosion. The maximum amount of effort is secured when the ratio of superficial area to volume is a minimum. This is true when the combustion chamber is a hemisphere as stated.

Difficult to Secure Hemisphere

It is difficult in the L-head and, of course, still more difficult in T-head engines to bring about anything like an approach to the hemisphere, but it is quite possible to minimize the combustion chamber pockets. This may seem a matter of common knowledge and yet within the last year certain engines have been improved in output by 20 per cent, simply because an amount of concentrated thought has been put on the combustion chamber design and the internal passages. Intake arrangements which were perfectly allowable with the fuel of 3 years ago are now just as obsolete as the carbureters of that time.

It has become well realized that the entire load cannot be thrown upon the carbureter manufacturer, that his good work must be followed up by good work in the intake passage and in the combustion chamber.



Specimen cut through cylinder head showing design of ports

Lewis Six Engine in Production

Exhaust and Intake Manifolds Combined in One Casting —Flywheel Housing Separate from Crankcase Casting

PRODUCTION has commenced on the stock Lewis six-cylinder engine. This power plant is built for the general trade by the Lewis Motor Corp., Detroit, which has been under way now for several months.

The Lewis engine is a block design 3¼ by 5 in. with the crankcase and cylinder block integral. This principle of combining the parts into units is one of the most notable features of the entire design. Outside and accessory parts have been eliminated wherever possible, so that the engine presents a clean and smooth appearance. The crankcase is ribbed and all the bearing brackets are supported in the case to prevent distortion due to crankcase deflection.

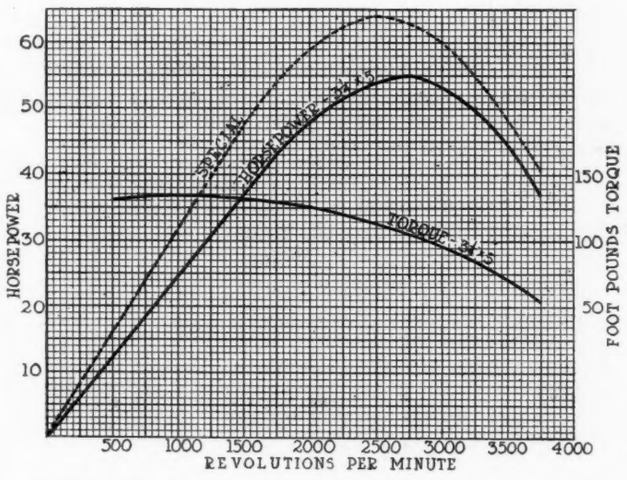
The crankshaft is of the "inherently balanced" type and is 2 in. in diameter. The connecting-rod and reciprocating parts are light in weight so that vibration is reduced to a minimum. Valves are 1¾ in. outside diameter. The cylinder head is of the separate type and contains cored passages for water on the valve side of the head as well as on the opposite side, thus overcoming the difficulties sometimes found in separate head motors where the valve seats distort from uneven cooling.

The flywheel housing at the rear of the engine is bolted to the crankcase and provision for alignment is made by means of dowel pins. The oil pan is provided with a flange which bolts directly to the bell-housing. This makes an extremely rigid support for the bell-housing, and at the same time provides an oil-tight seal at the rear of the oil pan.

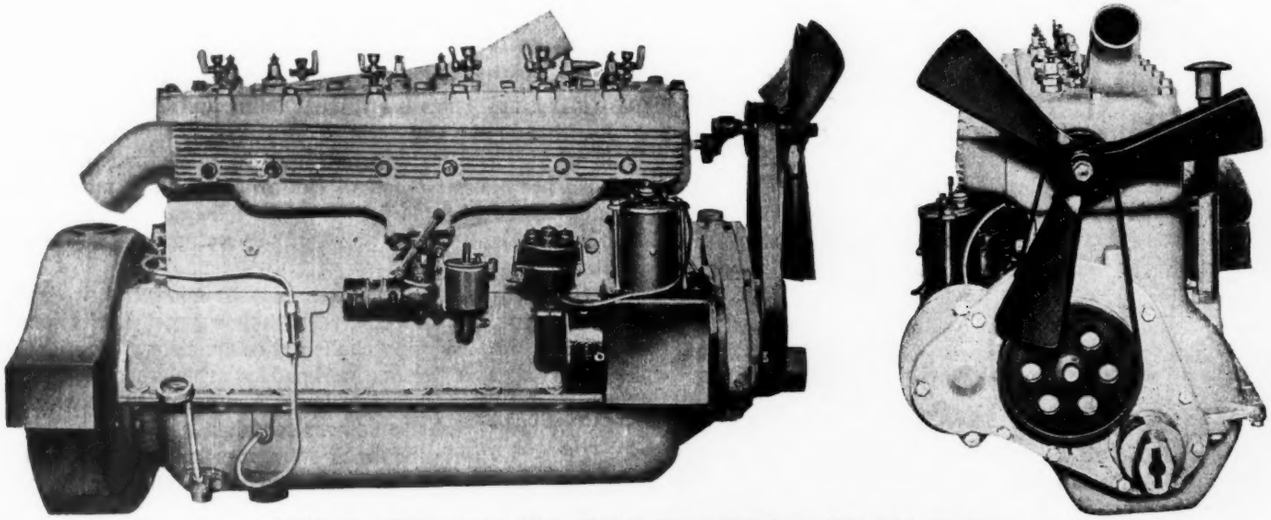
Combined Intake and Exhaust Manifold

A combination type of intake and exhaust manifold is provided. The manufacturers claim that the better heating provision of the combination manifold makes certain that the fuel is thoroughly broken up and enters the cylinder as a dry gas. The oiling is of the combination pressure and splash type. The pump forces the oil through concealed leads inside the crankcase to the various bearings and thence to oil troughs where the oil is picked up by the connecting-rods.

One of the features of the Lewis engine is the method of mounting the starting and lighting system by means of piloting directly into the crankcase opening instead of by means of brackets. This provision insures absolute alignment of shafts, making them all oil tight, and prevents any oil leakage around the instruments. This engine has been designed for the moderate price six-cylinder car where both durability and performance are required.



Horsepower and torque curves of the Lewis engine showing the stock product and the engine especially tuned for greater output



Lewis six-cylinder power plant, showing the combined manifold with the ribs for cooling. At the right is the front end of the engine illustrating the special type of multiple blade fan

MANUFACTURERS' MERCHANDISING

Manufacturer to Distributor, Dealer, Buyer

Eighth Article of The Automobile's New Department

What's in a Name?

Failure or Fortune of a Car Manufacturer May Depend Upon What He Christens His Product

WRITERS of successful fiction generally choose clean, crisp names for their characters. Makers of salable articles are not always so careful, except where those articles appeal to the feminine. Dainty names for dainty goods are the rule in the face cream line of business.

In the automobile business manufacturers have paid practically no attention to names. Both for complete cars and for accessories the average name is very poor. A good name must have a pleasing sound; a word, a name, can be a soft, sweet note or a crashing discord. The former attracts of itself; the latter repels.

A Good Car Name

Should Be Easy to Pronounce
Should Be Easy to Spell
Should Be Easy to Remember
Should Carry No Suggestion
Should Avoid Diminutives
Could Be Compound Name

A British writer in *The Automotor Journal* (London) analyzes names into classes. "Names are like clothes," he says, "and clothes may counteract a name." The body of a car is its clothes. A good body has sold many a car whose name would, otherwise, have made it taboo. Let us apply the theory of the intrinsic importance of names to automobiles. How, for instance, could Rolls-Royce have signified anything less than a powerful and finished car, or Argyll, Packard, Cadillac, Daimler, Fiat, Lanchester, Lancia, Napier, Vauxhall or Wolseley have been borne by cars of any but the first class?

"A Rolls by any other name would run as sweet" no doubt, for many a good car bears an ill-chosen name; but to start with a name like Rolls-Royce was to make success certain.

On the other hand, there are names, borne, many of them, by cars of repute, which seem ill-chosen and likely to act as a handicap. A few such names, taken at random, are, Motobloc, Vulcan, A-C, Humberette, Duo and G.N., as well as quite a big percentage of the names of American cars.

For the purpose of the argument I will divide the names of cars into classes: Class 1 shall contain names consisting only of initials, as G.N., E.M.F., G.W.K.; Class 2, names of one syllable, as Bell, Mass, Ross; Class 3, names with diminutive endings, as Humberette, including words whose endings have a diminutive suggestion, as Meteorite, Stellite; Class 4, descriptive names such as Rover, Swift; Class 5, names based upon the maker's name; Class 6, double names, such as Rolls-Royce, Léon Bollée, whatever their origin; and Class 7, names hard to pronounce.

I regard all the names of Class 1 as unsatisfactory, excepting cases such as that of F.I.A.T., in which the initials form a word. The use of initials instead of names results from familiarity, and the proverb is not untrue that familiarity breeds contempt. The general public, before whom the car, if it is a good one, comes after outgrowing the small circle of its familiar friends, are annoyed at having to use initials of which they know not the meaning.

The names of Class 2 are generally good, provided they are words of no particular meaning or suggestion.

Names of Class 3 are most unhappy. People have a healthy dislike for "ettes" and "elles"; the suggestion is of things that are half grown, miniature, neither here nor there. A small car or a light car may well enough have its place in a man's garage, but carettes, like marionettes and puppets, are better fit for a toy shop.

Class 4, descriptive names, may be good, but are apt to fail in two respects; they may suggest limitations or they may seem to challenge comparison. Cumikar, for instance, suggests a well-padded armchair on wheels, whilst Autocrat seems to boast a superiority of which no car has a right to be over-confident.

Class 5, based upon makers' names, are usually good, whilst best of all, perhaps, are the double names of Class 6.

Names hard to pronounce (Class 7) are distinctly unfortunate. The confession of ignorance or inability

is a thing we all strive to avoid, and I think that even the most strong minded of men would confess that sometimes he allows himself to sidestep a hard word.

Name Is Advertising Asset

And it should not be forgotten by the maker of a car that by far the most active advertising agent he has, the agent of longest reach and of greatest powers of insinuation and persistence, is the name of the car. The more it is used in conversation, the more readily it is remembered and the more quickly (other things being equal) it is written the better. Hence names hard to pronounce are a handicap to be avoided.

Often have I complained of our neglect, as a nation, of the remarkable successes and romantic career of that miraculous winner of races, the Peugeot, and always, in doing so, I wonder how much of the neglect may not be due to fear of trying to pronounce the word. The daring and unlearned pronounce it like Pew (in church pew) followed by G, O (as though spelling out the word "go"), whilst the learned priggishly correct one another with a hundred variations between "Poo-jaw" and "Perjure."

I admire the wisdom of the Gaulois people who write the phonetic spelling underneath the name of their goods. It would, however, require *some* speller to write Peugeot phonetically.

A car's name should satisfy as many as possible of the following conditions:

It should be easy to pronounce, spell and remember.

It should have no particular meaning or suggestion, first, on the principle that to include is to exclude, and next because people respect that which they cannot understand.

It should avoid the suggestion, if it be a small model, of "dinkiness" or immaturity.

Hyphen Not Necessarily a Drawback

If it be a really good car there need be no hesitation in giving it a double name with a hyphen, for although people are beginning to look askance at men with hyphenated names, because so many nonentities have sought advertisement by fitting headlights to their names, the principle underlying the attraction of such names still holds, and as yet the nonentities among cars have not spoiled the pitch.

Chicago Trailer Buses of New Type

AN entirely new type of trailing bus has been put in service in Chicago, the start being made March 25. The buses are a combination of a front-drive tractor and a trailer, each having one axle. The trailer which carries the passengers is a product of the St. Louis Car Co. and is supported on its own two wheels which carry the brakes only, the drive being handled through the axle of the tractor which constitutes the front axle of the bus. The engine is a Knight sleeve valve 4 by 6 in. and is made by the Moline Automobile Co. It drives a three-speed selective gearset separate from the motor and from the rear of this gearset a sprocket drives a silent chain to another sprocket on a driveshaft which extends to a worm gear on the front axle, there being a universal joint in the unit. From the worm gear the drive is conducted to the front wheels through universals within the steering knuckle assembly.

Views of one of Chicago's new motor buses of the trailing type

There is complete Bosch starting, lighting and ignition, including a Bosch magneto driven from the timing gears. The engine is four-point suspended on a separate frame which is anchored to the front cross member of the main frame and a cross member between the engine and the gearset. There is a Zenith carbureter which receives fuel by gravity from a tank fitted into the cowl. Springs both on the tractor and on the trailer are semi-elliptic.

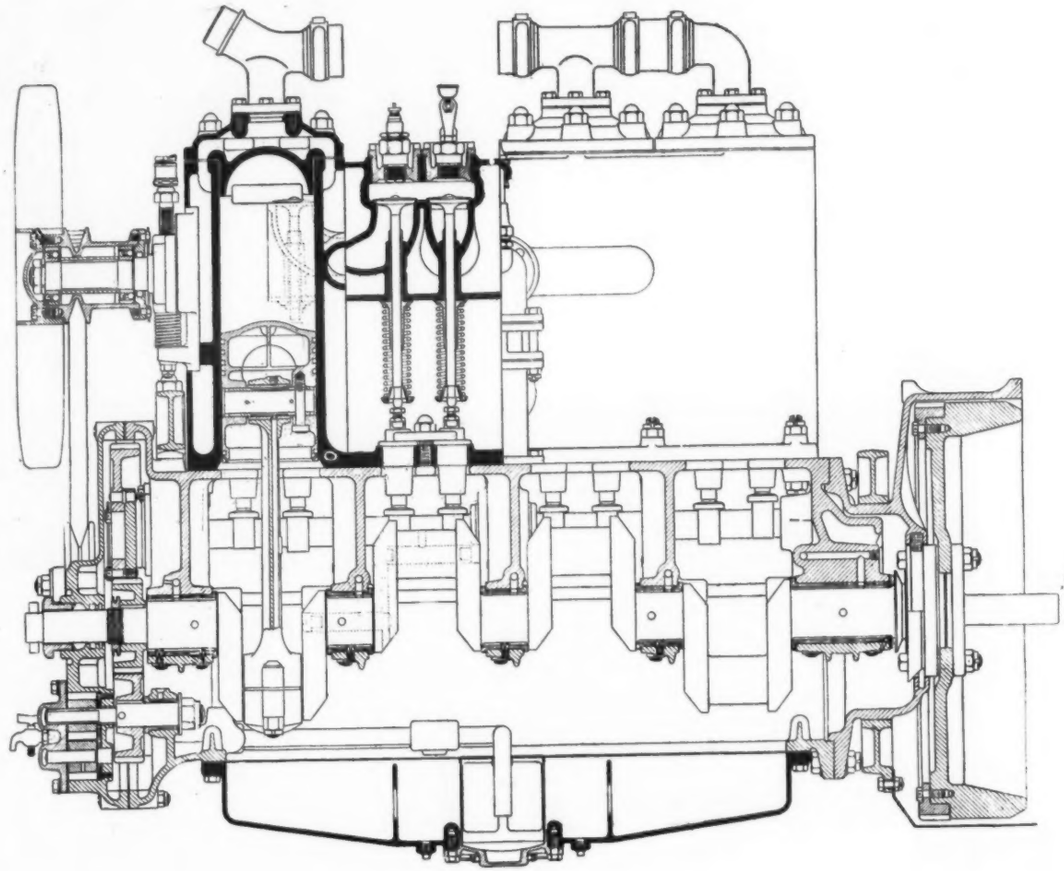
The vehicles are double deckers and are built by the Gas Electric Motor Bus Co., New York. They have a seating capacity of fifty-one passengers, twenty-two on the lower deck and twenty-nine on the upper. There is a stepless entrance and an inclosed stairway.

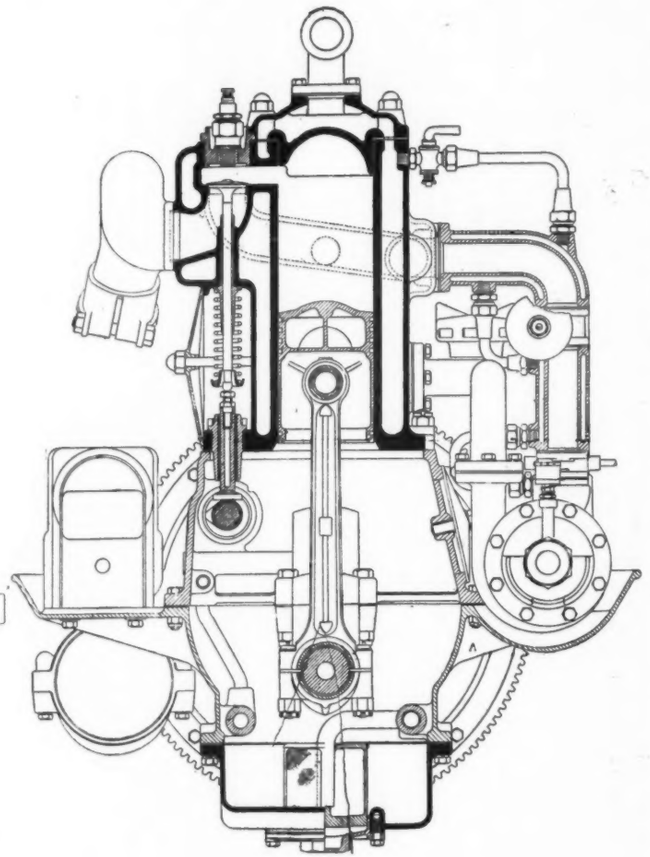
Fifty buses are to be put into operation within 30 days, eleven being now in service. The remaining thirty-nine already have been built and are on the way to Chicago. With fifty in operation the buses will run from 3 to 6 min. apart and express and local service will be a part of the system. The buses are manned by a conductor and driver and will be run from 6 a. m. till 1 a. m.

U. S. A. Cars Aid Gold Coast Roads

FRENCH WEST AFRICA, March 2—American automobiles have led to extensive road development in the Gold Coast and Ashanti districts, according to the annual message of the governor of the Gold Coast Colony.

Until 1913 the road conditions in this country had been bad, as it was not feasible to build thoroughfares to withstand the wear caused by heavy vehicles.





Model	Bore	Stroke	Piston Displacement
C	3½	5⅛	197.23
C-1	3⅝	5⅛	211.58
C-2	3¾	5⅛	226.42
C-3	4	5⅛	257.61
M	4	5½	276.45
M-1	4⅛	5½	294.00
M-2	4¼	5½	312.09
M-3	4½	5½	349.90

HERCULES ENGINE FOR TRUCKS

This Engine Is Made in Eight Sizes and Intended for Commercial Vehicles Only

A Robust Truck Engine

Eight Sizes of Similar Design All for Trucks Only Comprise Hercules Series—High Standard of Engineering

IT is to be doubted if there is a more sturdily built truck engine to be found than the Hercules, which is made in eight sizes by the Hercules Motor Mfg. Co., Canton, Ohio. Ranging from 197 to 350 cu. in. displacement, the design is practically the same throughout and it is of the most rugged character. There are not many peculiarities, but chief among the departures from the normal the separate cylinder heads should be noted. These do not cover the valves, which are in a side pocket that is part of the main cylinder block, and this allows the heads to be made circular, so that they will take circular gaskets instead of requiring a special shape. The internal form of the heads gives about as good a combustion chamber shape as is obtainable with an L-head cylinder.

In connection with the cylinder block it will be seen that the waterjackets are carried much lower than usual and that there is an annular passage of large size communicating with each of the head castings. For the crankcase either iron or aluminum is used, according to the customer's choice. Stout webs, or trays, are cast integral with the lower half, these filling in the space between the crankcase and the side of the frame.

Five Bearing Crankshaft

It will be noticed that a five-bearing crankshaft is employed, and this is a quite elaborate piece of work, being drilled with a ¾-in. hole through each of the main bearings. Oil is pumped through cast-in piping to each of the five bearings, and conducted thence to the crankpins and to the piston pins, via tubes attached to the connecting rods. The somewhat unusual location of the oil pump in the timing gear case has great advantage on the score of accessibility, this quality being conspicuous throughout the whole engine.

Another noteworthy point is the suspension. The front end of the crankcase hangs from a forged cross member of the frame, but this is the rigid end of the three-point layout. The bell housing for the flywheel is separate from the crankcase and is turned with a narrow neck of circular form, and around this is a yoke which is part of a malleable iron piece which also mounts as a frame cross member.

Governor on Intake

The jacketed intake is designed to suit a high-placed carbureter with pressure or vacuum feed, but it is so laid out with relation to other fittings that a much longer vertical member can be used to give a low carbureter if required. Governing is intended to be cared for by any of the known intake control types of instrument, and the front end of the camshaft is suitable for the attachment of a governor drive, either rigid or flexible. Any standard magneto, and any conventional starting and lighting equipment can be fitted, a refinement in the latter connection being the use of a forged steel gear ring for the starter.

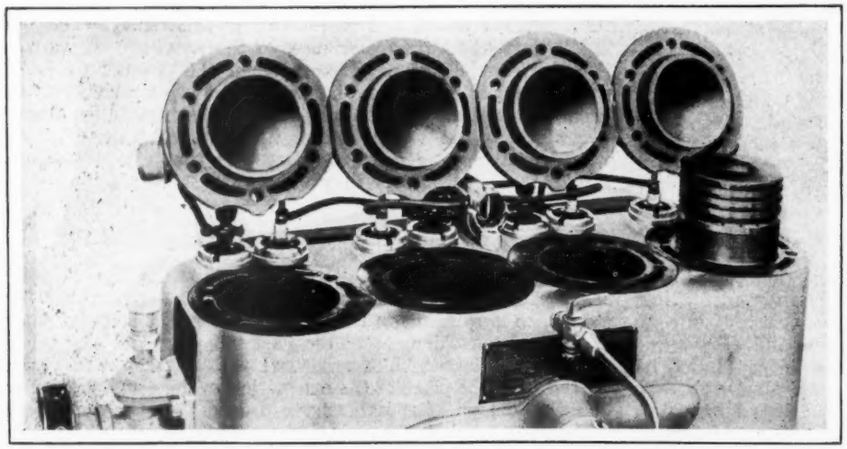
The camshaft is of the one-piece type, running on three bearings the two front ones of which are of sufficient diameter to allow the shaft to be withdrawn endwise. Valve lifters are of mushroom form, all interchangeable, as are the tungsten-steel valves. The tappets and springs are carried in a conventional pocket on the right side of the engine, covered by a single pressed-steel cover plate in the M-series engines and by two such in the smaller ones.

Brass-backed Fahrig-metal main bearings are employed, white-metal bearings being used for the camshaft. The timing gears are of the helical type, drop forged of high-carbon steel. Shims for the main bearings are laminated, so that in adjusting them it is not necessary to file the shims down, but merely to peel off one or more of the thin laminations.

Pistons are made of the same semi-steel of which the cylinders are cast and each carries five rings, the fifth an oil scraper on the skirt. Connecting rods are 40 per cent carbon steel drop-forgings, heat-treated. Two bolts are used at the crank end. Wristpins are of low-carbon seamless-steel tubing, case hardened and ground. The pin is held fast in the piston bosses, and bears in a Non-Gran bronze bearing held by the connecting rod.

Cooling is secured by centrifugal pump circulation, the pump being driven by a separate gear in the heavy models and by the same shaft that drives the magneto in the lighter ones. The water intake is at the bottom of the cylinder block and at its middle, from which a straight syphonic rise leads it to the openings into the separate heads.

The very substantial fan mounting and adjustment which is clearly shown in the drawing on the opposite page is particularly commendable, as this part is important.



Hercules cylinder block with heads removed, showing free water passages, deep flanges and manner of removing pistons and rods through heads

Foreign Trade Department

International Trade After the War Will Rapidly Assume Normal Proportions—Motor Trucks Will Facilitate Development of Tropical Half of World

¶Editor's Note.—Following is a digest of an address delivered before the Editorial Conference of the New York Business Publishers' Association by O. P. Austin, statistician National City Bank of New York.

INTERNATIONAL trade after the war will be quite similar to the international trade before the war. The great trade currents which have been developed in the century since the steam vessel and railway reconstructed the commerce of the world and multiplied its activities, are the result of natural conditions which cannot be permanently interrupted by even such a titanic struggle as that which we are now witnessing. Certain great sections of the world have become its chief producers and distributors of manufactures and must so continue for many generations, while certain other sections have become and must continue to be the chief producers of foodstuffs and manufacturing materials. The trade currents established by the exchanges between these great sections must continue, while the exchanges between countries only separated by imaginary lines and thus made at less cost than those with more distant countries will speedily resume, both as a matter of convenience, and business economy, and business, as you business men know, is little influenced by sentiments.

Trade Relations of Warring Countries

Great Britain alone sells in times of peace to the Central Powers about $400,000,000 worth a year of her products, and buys from them another $400,000,000 of merchandise which she must have, and which it is more convenient for her to purchase from that nearby territory than to bring at greater expense of transportation from other parts of the world. France sold to the Central Powers in the year preceding the war about $200,000,000 worth of merchandise, and bought from them $250,000,000 worth. Russia's exports to the Central Powers averaged $250,000,000 a year, and her purchases from them $325,000,000 a year.

Italy's sales to them amount to $125,000,000 a year, and her purchases from them $175,000,000 a year.

Belgium's imports from them amounted to $160,000,000 per annum, and her sales to them $220,000,000.

Germany's imports from the Allies and their colonies amount to over $1,000,000,000 a year, and her exports to them a full billion; Austria-Hungary's imports from the Allies are $600,000,000, and her exports to them over $500,000,000, while the trade of Turkey with the Allies is about $150,000,000, making the recorded trade of the Central Powers with the Allies about $3,000,000,000 a year; while the records of the Allies also show their trade with the Central Powers about $3,000,000,000.

What will be the industrial and therefore the commercial condition of the belligerent countries after the war? There are some who assert that their population will be greatly reduced as a result of the 4,500,000 killed or fatally wounded up to this time. But those making this assertion forget, apparently, that the countries at war are constantly increasing their population, that there is in all cases except that of France, a large excess of births over deaths, and thus a net gain in population. The annual net increase in population in recent years has been, in Russia 2,900,000; Germany 825,000; Austria-Hungary 403,000; Great Britain 393,000; Italy 362,000; Belgium 73,000, and France 64,000, making the annual average of net gain in population of the European countries now at war a little over 5,000,000 per annum. Of this number approximately one-half are males, and we may thus assume that the net increase in the number of male persons entering the industrial age, and thus available for industrial pursuits in the countries in question, is during the 2½ years since the beginning of the war about 6,000,000, while the war losses by death and permanent disability, according to the latest computations, are but about 4,500,000. In addition to this is a well known fact that in all these countries the loss by emigration has been suspended, and that many of their former emigrants have been called home. Then too there have been in those countries large additions to the number of women employed in industrial and business pursuits. We may, therefore, safely assume that the countries in question, when they emerge from the war and return to the pursuits of peace, will find themselves with a materially larger industrial, and therefore commercial, element than they had at the beginning of the war. More than this, the industrial machinery has been speeded up to a much greater producing power than ever before.

We must now expect that the chief gains in our exports in the future will occur in manufactures, and while we shall have a harder fight to develop an increased trade in manufactures than we ever had in selling the natural products, because of the sharp European competition which we shall encounter in manufactures, we must make that fight if we are to maintain our rank and prosperity as an exporting nation.

Europe will soon be able to supply its own requirements in this line, but in all the neutral world, North and South America, Asia, Africa, and Oceania, the demand for manufactures will continue and increase with the general revival of business and industrial development which will come with a return to world peace. And it is to that field that our manufacturers should give their special and earnest attention. They must adopt the methods which have given our rivals success in that field, make the goods to suit local requirements and customs, and sell them upon the accommodating terms to which the people of those countries have been accustomed for generations.

The great tropical section of the world is yet undeveloped in its prdoucing power and therefore its purchasing power, and it is a field which the experiences of the war have shown us a practical method of development. Yet the commerce of this great tropical belt, with half the land area and half the world population is but one-sixth that of the international commerce of the world, and it has but one-seventh of the world's railways, despite the fact that the temperate zones are anxiously calling for its products of food and manufacturing material.

Motor Vehicles Will Conquer Tropical World

And it is with reference to this great area, whose products the world is now demanding, that the war has given us a lesson which may result in its speedy conquest. The chief cause of its slow development in the past has been the absence of any method by which the natural products could be transported from the place of the production to the common carrier. But the lessons of the war have proved that the automobile and motor truck are capable of transporting men and merchandise over comparatively roadless areas, and the flying machine capable of facilitating a close study of topographic conditions in any climate and under any circumstances.

Benefits Count at Cadillac Factory

Industrial Relations System Based on Gratitude

By Allen Sinsheimer

One of the factory lunchrooms in which more than 400 men eat daily

¶ *EDITOR'S NOTE:—This is the fourth of a series of articles based on an intimate study of the work being carried on by our large automobile, motor truck, tire and accessory makers to improve industrial relations. Better home and working conditions are two features that are emphasized. The promotion of health by the B. F. Goodrich Co., the Goodyear Tire & Rubber Co.'s solutions of housing and other problems for its workers and the system for reducing labor turnover at the plant of the Firestone Tire & Rubber Co., were features of previous issues.*

THE Cadillac Motor Car Co. believes that gratitude and nourishing foods are powerful factors for creating improved relations between employers and employees. It has established a system based on the principles that men who receive benefits are certain to feel gratitude, and that an insufficiency or inferiority of food prohibits efficient labor, so it expends $25,000 annually, an average of $3 per man, in this work.

Organized work for the advancement of cordial connections between the Cadillac company and its workers commenced about 6 years ago when the company first recognized that the unorganized manner in which the problem had been handled previously was not bringing to the men in the factory the measure of good result desired.

Benefit Society Has 7700 Members

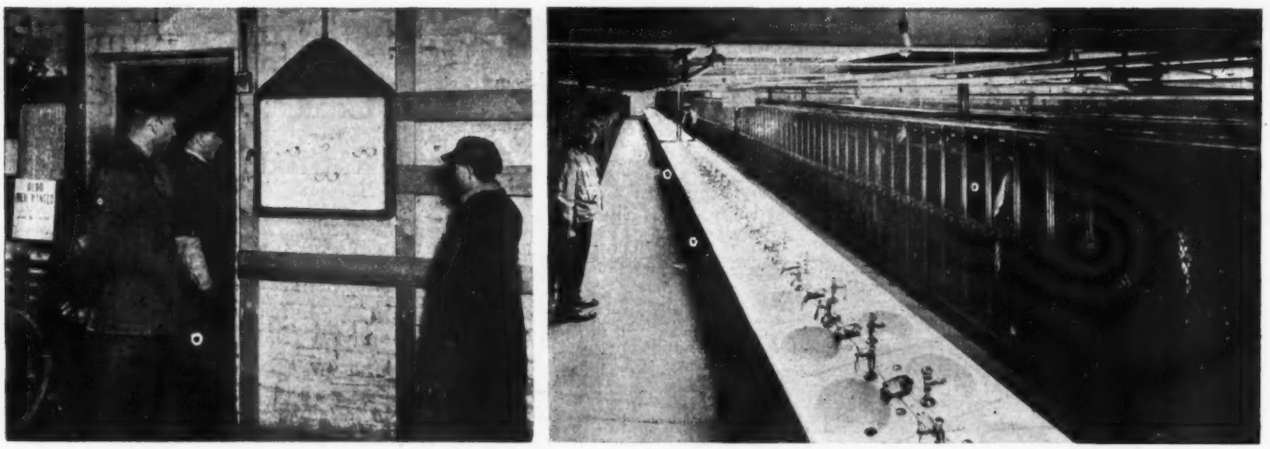
The first important step followed numerous requests from employees for some sort of organized effort, in which they could participate, to eliminate the very frequent and burdensome practice of "passing the hat" in cases of sickness or death among fellow workers, and resulted in the forming of a benefit society. It is about this society, which the company has fostered in every possible way, that all of the later plans for improvement of working conditions have been built. The eight branches of accident prevention, medical aid and inspection, restaurant and factory dining rooms, trade and continuation schools, co-operative buying, legal aid, benefit and mutual aid, and social and recreational work, are consequently affiliated with the benefit society.

Following the petitions of the trim and paint shops for a benefit organization, the society was formed in 1912 which to-day numbers 7700 members. Dues are payable weekly and amount to 10 cents each 7 days. In event of sickness or accident, the members are entitled to draw $1 a day for 6 months with a $150 benefit in case of death. More than 2200 benefits with twenty-five deaths, involving a cost of $22,324, were paid in 1916. Men injured in the shops receive an additional compensation through state laws. The society has collected approximately $72,000 in the 4 years of its existence and paid out about $50,000, leaving a surplus of $22,000.

The society membership is promoted by the company by various rewards and additional benefits. For example, a number of beds are maintained both in New Mexico and Michigan, where those workers who contract tuberculosis and who are members of the society, are sent, at the company's expense, until cured. In addition, the company provides for the man's family until he is able to return to work. It also pays all costs of administration of the society, providing office space, clerks, a manager and an advisory committee, and always endeavors, when compensations are paid, to examine the worker as to his opinion of the plan.

At a time following the formation of the society, the workers intimated that they would welcome anything which would enable them to secure a noon-day lunch without having to patronize either the near-by saloons or the more or less high-priced public restaurants; and this resulted in the establishment of shop and office restaurants where a variety of food, wholesome and well cooked, may be purchased at cost.

In the beginning the effort in this direction was confined to the serving at noon, and in the evening for overtime men, of a thick soup or meat stew, in quart cups, a quart of the stew and two slices of bread being sold for



Left—A safety first bulletin. These are posted at all entrances and display safety first warnings which are changed weekly. Right—Steel lockers and washstands provided for all employees

6 cents. This was delivered to the various shop departments on trucks, the men eating at their benches or machines. The service became popular, but at the same time proved rather uncomfortable, so the company turned over a section of a warehouse where long tables and benches painted a light gray and covered with white oilcloth were installed. A counter in the center of the room was used as a distributing point. It was found that a quart of the stew was too much for the majority of the men, so the quantity was cut to a pint and sold for 3 cents. From this beginning, the restaurant idea has grown until now the company operates two large restaurants and four lunch counters. A steward is in charge of the service, a chef in charge of the kitchen and a storekeeper and fifteen men besides fifteen others who aid at noon. Both restaurants operate on a cafeteria plan and in addition to the meat stew sell salads, fruits, pies, coffee, milk, tea, etc., each portion being sold for one ticket, which represents a value of 3 4/7 cents.

Stop Work for Milk

The company attempted to separate the men who performed grimy and oily work by the installation of tables and counters and by charging 5 cents for milk and coffee served in glasses instead of cups, but the plan failed, as it was found that the dirtier workers took equal advantage of the tables and the glasses. The restaurants and lunchrooms feed 1200 men daily, doing a yearly business of $50,000, besides transacting a large business in box lunches and milk. The box lunches, of which 600 are prepared daily, are sent to outlying branches and sold at 14 cents.

An unusual plan is found in the milk recesses which the company introduced 3 years ago. At that time one of the company officials fell ill, and, following a milk diet, found it so beneficial that he requested its trial in the shops. In addition, the company, by scientific research, found that many of the men were fatigued at certain periods of the day, as is shown by the accompanying chart, and the milk experiment was made. The men were allowed to stop work at 9 a. m. and 3 p. m. for 15 minutes at each time, and to purchase a pint of milk each for 3 cents which they could drink while resting. This plan proved successful and has been continued to the present. More than 38,000 pints of milk were thus sold in the month of January. Owing to its increased cost, the company lost $339 on this quantity, and has now raised the price to 5 cents a pint. The company estimates that it costs 3½ cents to prepare and sell each portion in its restaurants. There is a loss of ½ cent in this transaction which is made up by the box lunch and sandwich sales at the outlying shops.

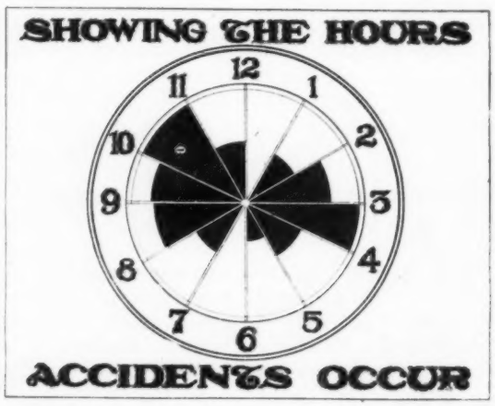


Chart displaying those hours when workers slacken in their productive capacity and tend toward a carelessness that provokes accidents

Accident Prevention Work

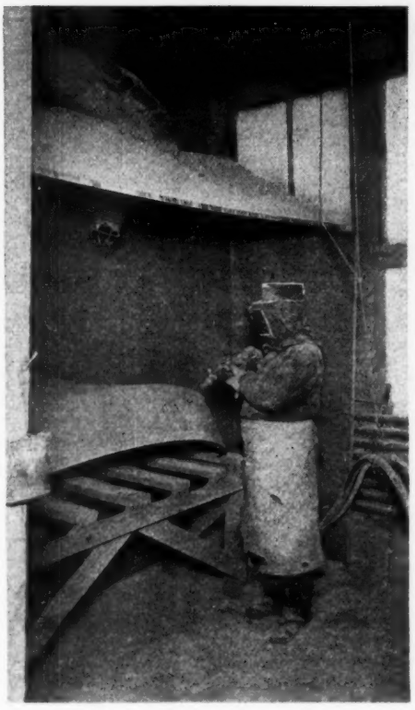
The company's division of accident prevention is in charge of a safety engineer who with a draughtsman and three assistants looks after the elimination of all accidents insofar as is possible in the various plants. He designs and installs such mechanical safeguards as appear proper to him and is the arbiter as to what is or is not safe manufacturing practice. Upon having an unsafe condition called to his attention, which may be remedied by the installation of mechanical devices, he proceeds, with his assistants, to the designing, building and installation of such guards. Hazards which may be eliminated by some action of the foremen or superintendents are called to their attention by a written notice which also indicates a time limit. Failure to conform to the notice brings the foreman or superintendent before a safety committee composed of factory executives, where he is given an opportunity to show if the order is unreasonable, unnecessary or uncalled for, and the decision of the committee is final in regard to its character.

Among other devices designed by the company's safety engineer is one for the elimination of hazard in the sand-blasting rooms, illustrations of which accompany this discussion. This has been patented by the company to prevent financial exploitation, but any concern can secure permission to use it in its plants. Accidents have been reduced 80 per cent in the past 5 years among the company's plants, and in individual instances the reductions are very remarkable. The injuries suffered from fellow workers have decreased 71 per cent, hand slips 67 per cent, tool slips 55 per cent, machine operations 48 per

cent, carelessness 78 per cent and grinding 40 per cent.

The medical division comprises a chief surgeon, three physicians, a dentist and six trained male nurses. A physical examination is given to each applicant for employment, which is quite comprehensive though it is not complete, and applicants are not required to strip. About 1½ per cent are rejected for physical defects of whom one-half usually cure themselves and are eventually accepted. This division treats all accidents, no matter how trivial, dispenses information, diagnoses ills, extends nursing service to families of workers, makes dental examinations and calls attention to various unapproved methods of living. The department handled 85,684 cases in 1916 of which 46,900 consisted of minor injuries and the balance of sickness.

The emergency hospital equipment is of modern type, the interior of the rooms being furnished in white enamel with a granolithic floor and provided with individual white porcelain pedestal washstands with foot control of hot and cold water and waste. A steam sterilizer capable of bringing cold water to the boil in 40 seconds and an electric dry sterilizer provide the means for keeping instruments and dressings clean. An eye-operating room is equipped with suitable electro-mechanical apparatus.



The usual method of protecting sand-blasters. Few men can withstand the evil effects of this work for more than 6 months

Have Professional Fire Marshal

Fire prevention is in charge of a fire marshal who is a retired captain of the city fire department. He has under his direction two assistants whose duty it is to make periodical surveys of the works and to recommend to the foremen and department heads such steps as are necessary to eliminate or minimize the fire hazard. All plants are equipped with fire doors, extinguishers, hose stands and are protected by volunteer fire brigades.

The legal aid department extends legal advice to employees and also handles loans. No court work is performed but full advice is offered and every effort is made to prevent garnisheements against Cadillac employees. Creditors of workers who are in debt are requested to call at the legal aid office where an attempt is made to induce both the employee and the creditor to accept a plan whereby payments of $2.50 or some like amount are made weekly. This department has found that the men often are less in need of legal aid than of common sense advice.

The company does not allow its employees to draw money against future wages, but through its loan department will make small loans of $25 or $50 to workers and allows them to give their "word" as security. These loans are paid back in installments amounting to whatever the employee believes he can afford and the department cautions the worker against making a promise he cannot keep—of setting installment figures at too high a basis. The money used for the loans is drawn from the "unclaimed wages," which amount to about $2,000 per year and constitute the wages of men who work for a day or two and leave without demanding their earnings. This plan which was recently placed in operation has, to the present, produced

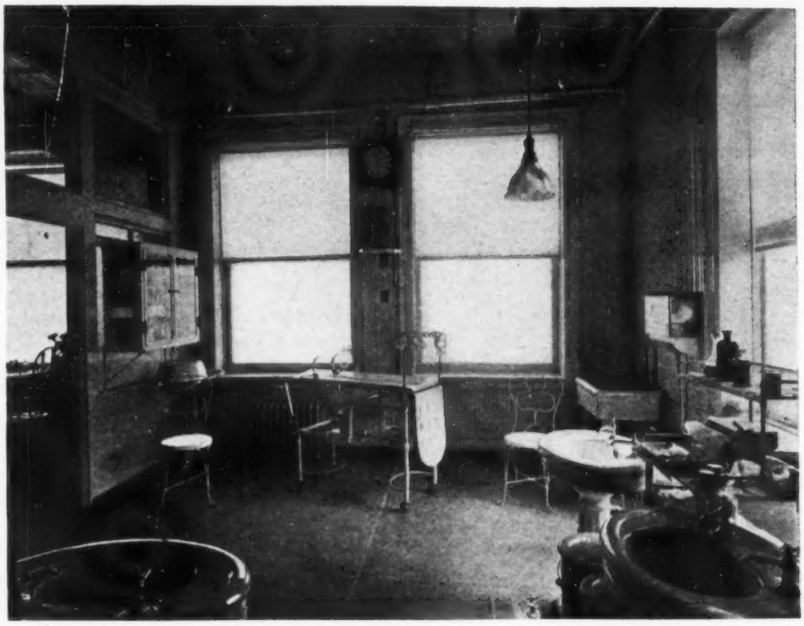
The Cadillac method of protection for sand-blasters which has proved a complete success and eliminates the hazards formerly encountered in this work

The rear view of the Cadillac sand-blast plan. The company holds patents for this plan but will readily grant permission to use it in other plants

no financial loss. In fact, the workers seem anxious to come in with their payments and display their honesty.

The co-operative store started by the company 3 months ago is selling dry groceries to all members of the benefit association on a coupon book basis with prices 10 per cent above cost. It saves the employees from 20 to 25 per cent on their home needs and has proved extremely popular. Daily sales now amount to between $60 and $75 and are as yet insufficient to pay all operating costs, but the growth of the business insures an optimistic outlook for the future.

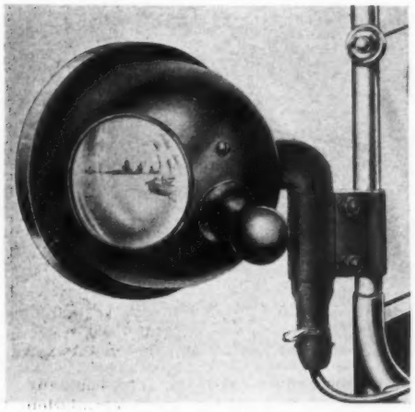
The service school operated by the company includes a regular course with final examinations. The men, including service men from dealers throughout the country, attend the classes dressed in overalls, and have a standard Cadillac eight for a subject. The course covers a period of 2 weeks, and the men are taught to take down, assemble and adjust the car. Special attention is given on the electrical system, and special insight into Cadillac work is extended by trips through all the different departments. After the car has been reassembled the class is taken for a ride and the instructor stops at a convenient spot, inviting the men to look over the country while he installs a defective coil, carbureter or other part in place of the perfect one, and then ascertains the ingenuity of the men by their attempts to discover the trouble Classes are given rigid written examinations following the 2 weeks' study and each examination paper is forwarded to the dealer who is responsible for sending the student to the factory to take the course.



More than 80,000 cases of minor and major ills are treated in the emergency hospital of the Cadillac company every year

Gray & Davis Long Distance Spot Light

PIERCING illumination is the distinguishing feature of the Long Distance spot light which is now being put on the market by Gray & Davis, Inc., Boston. The beam of light is maintained by an accessible adjustment and the switch is located in the stationary part of the bracket. Another feature which is claimed to be peculiar to the Gray & Davis construction is the smooth-turning "stay-put" joint which is also appreciated during the day time use of the mirror attached to the case of the lamp as shown in the illustration, which also gives an idea of the neat mounting, the wires being carried down through the bracket attachment, thus eliminating any swinging wire. The lamp is designed to blend with the lines which are characteristic of modern body construction and can be readily attached to any windshield.



New Gray & Davis spot light

The lamp is finished in black with a nickel door and the reflector is a true parabola plated with silver of the highest U. S. government assay. The lamps are made to be water and dust-proof. Nitrogen bulbs are furnished and the diminishing type of mirror is used. The diameter of the door is 6¾ in. The spot light, which has the model name E-30, sells for $7.50.

Duluth the Seat of One of Wealthiest Counties

DULUTH, MINN., March 24—Because of the fact that Duluth is the seat of St. Louis county, one of the wealthiest counties in America, and the hundreds of mines are operating in full blast, the prospects for the automobile industry in this territory during 1917 are very bright.

This tremendous ore business on both the Mesaba and Cuyuna ranges reflect on the prosperity of the community and the way the dealers are buying cars at the third annual automobile show this week is a surprise even to the factory representatives. One Virginia dealer ordered forty trucks, another at Hibbing ordered thirty trucks, while a Duluth man arranged to ship ten large buses to another range town.

St. Louis county has the wealth of an empire; it is richer in resources than any of the States of Wyoming, New Hampshire or North Dakota and has an area in square miles that is greater than any of the States of Rhode Island, Delaware or Connecticut.

The total assets of the county are $340,000,000, while the liabilities amount to but $500,000.

In addition to this rich territory adjacent to Duluth, which local automobile dealers serve, there is the Red River valley country, where there are hundreds of farmers.

The bank clearings of Duluth for 1916 were nearly $23,000,000 greater than those of 1915. The clearings for 1916 totaled $306,256,916.63, while in 1915 they were $283,812,916.77.

There are approximately 2000 automobiles in use in Duluth to-day, an increase of 600 over last year.

The FORUM

Daylight Saving Would Inconvenience Traveling Public

By A. L. Hoover

IN THE AUTOMOBILE for Feb. 1, appears an item in regard to the National Daylight-Saving Convention in New York City which interested me very much.

I wish that you would either communicate with the people that have this convention in charge or suggest to them in the columns of your paper that they use a little common sense in the handling of this proposition and not be governed wholly by their own selfish desires of gaining a little more daylight by always getting up at a certain time by their watch or clock.

A change in time, as outlined in the article, would inconvenience the traveling public to such an extent that I doubt if they would ever be able to tell where they were at.

I live near Cleveland, Ohio, where they tried to regulate the sun, moon and stars by adopting Eastern time, and if what people said when they missed trains by having the two times or where they have to wait an hour longer at the station for a train than they really should could be heard, I think their ears would burn.

The fact of the matter is, if these people who want this extra hour of daylight would simply get up 1 hr. earlier and go to bed from 2 to 4 hr. earlier, it would be a good deal better for their constitutions and not inconvenience everybody else. Instead of setting their clocks ahead an hour, all that it is necessary to do is to get up 1 hr. earlier and the same object is accomplished without any inconvenience to anybody.

I trust that you will take this for what it is worth and if any suggestions can be made to cause these people to handle this subject in a common sense manner, I for one know that it will be appreciated by the traveling public generally and many individuals particularly. I know whereof I speak because we have this trouble almost every day in our dealing and connections with Cleveland business.

Air Cooling Advantages

By Chas. E. Duryea

W. W. WELLS seems to be in some doubt about the increased efficiency of the engine having a hotter cylinder wall, according to his communication in THE AUTOMOBILE for Jan. 25. It is true that a hotter wall or jacket does lessen the heat loss there and so keeps the working charge hotter all through the stroke and causes the exhaust to pass out hotter. But this is a gain and of some moment. In the usual water-cooled engine simply raising the water temperature may not show a great power gain, but we must design the engine to suit the conditions under which it will work and then must provide carbureter and similar fittings to suit. When this is done we will get a really high economy.

The performance of air-cooled engines when well made proves this. The economy contest has practically ceased to be held for the reason that the water-cooled engine cannot even get a place. Why makers continue to use water and struggle for high mileage I do not understand. Some day there will be the biggest rush to get into the air-cooled ranks that the business has ever seen.

The big gain is not that there is a very great addition to the heat units turned into power by saving some from the walls, but that having a hot cylinder we may use its heat to heat the next charge and so use less fuel. The experimenter who will make his mixture leaner as he heats his cylinder walls will find where the air-cooled engine's economy comes from.

Mr. Wells also thinks air cooling not uniform. Does he mean to imply that water cooling is uniform? If so, he must think again. The average water pump runs slowly when the engine is doing its best on high gear and a hard pull, with the result that the cooling is not sufficient for the engine design and adjustment, and on the low gear, when the engine is racing and not pulling to the limit, the pump is racing and deluging the cylinders with cool water, although at this high speed there is no danger of overheating and pounding. The thermostat betters these conditions very much and is to be advocated.

But if a more uniform cooling is desired than the best air-cooled engines get, what is to prevent applying the thermostat to them? It could be exposed to the air current as it comes from the cylinders and close down the draft openings as the temperature gets low.

It is now a well-known fact that the four-cylinder automobile engine is fairly economic when worked at full power, but we use such large engines nowadays that we practically never use them at full power and they fall off very fast in efficiency when we throttle the charges and so reduce the compression. The two-cylinder does not change compression appreciably and so at half power shows very high economy, although not so economic as the four-cylinder at full powers usually. People who wish to save fuel will sooner or later come to the two-cylinder and air cooling. The cost and internal friction are much less also.

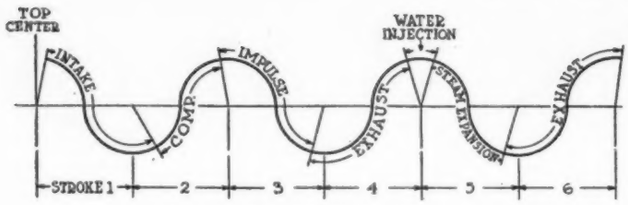
Mr. Wells is quite right that a properly designed engine can run as well at a high temperature as at a low one. High compressions may be a little more jerky at low speeds, but high temperatures are not, so long as they stay below the pre-ignition condition. There was a time when we had to keep the engine cool in order to lubricate it, but there is no trouble now to oil a cylinder at twice 200 deg. And surely it is wasteful to run an engine with its walls so cool that the fuel is not vaporized when it strikes them. Yet this happens right along to-day, for our fuels contain much heavy kerosene which remains liquid on the walls and runs into the crankcase, where it harms the lubricating oil.

Is Six-Stroke Cycle Possible?

By Carson W. Smith

REFERRING again to previous discussions in your paper of the possibilities of other cycles for the gas engine than the conventional two or four-stroke type, I would like to ask whether the following cycle has ever been proposed or tried? Reference here is made to a six-stroke cycle, internal water cooled, Diesel-type gas engine, designed for slow speed large unit stationary or marine purposes. Description of engine is as follows:

If you will refer to descriptive sketch attached hereto, showing diagram of the cycle and also valve timing, you will note that the first four strokes consist of the conventional Otto cycle. At the end of the fourth stroke and the beginning of the fifth, there is an injection of distilled water into the combustion chamber. Fifth stroke consists of expansion of resulting steam, and the internal cooling of cylinder and piston. Sixth stroke is another exhaust stroke. Take, for instance, a standard type Diesel engine. Drive the cam-



Six stroke cycle diagram

shaft one-third instead of one-half time. Modify cams to obtain the proper valve action. Add water injector apparatus, and we have, roughly, the proposed engine.

A number of interesting questions occur, which I list below.

Cylinder and piston contraction stresses, due to water injection.

Cooling capacity of this method.

Power possibilities of expanding steam.

Theoretical gains.

Difficulties and disadvantages.

The only reason, of course, for adding these two strokes to the cycle would be the expectation of realizing another impulse stroke due to the steam expansion, thus cutting down a part of the heat losses of the conventional cycle. The extent to which this can be realized determines whether or not it would be worth while trying to do at all. In order to obtain a rapid vaporization of the injected water, it would be desirable to retain on the interior surface of the combustion chamber as much of the heat as was possible, which is contrary to water jacket cooling. The higher the internal temperature, the quicker the vaporization, and the greater the relative cooling capacity of the water, and consequently the greatest possibility for increased thermal efficiency. This brings up again the question of limiting cylinder temperatures. It may be possible by certain methods to raise this somewhat over modern practice.

If all the above has not been fully settled at some previous time, it may be that the proposed cycle warrants some discussion and investigation. Distilled water is, of course, much cheaper than even crude oil, and relatively easy to obtain even on a submarine.

Die Cast Piston with Scraper

By Ferdinand Jehle

Service Engineer, The Aluminum Castings Co.

ON page 518 of the issue for March 8, 1917, of THE AUTOMOBILE, there appeared an article, "Stages in Alloy Piston Design," by Joseph Leopold. Mr. Leopold evidently does not possess the latest information on Lynite pistons, since he makes the statement that it is not possible in the permanent mold process to use a scraper ring without making a piston with very thick walls, unless the piston be relieved on the outside.

As a matter of fact, it is not only possible but not at all difficult to make the piston wall very thin and add metal only around the wiper ring groove much the same as in the piston he illustrates in Figure 3 of his article. The accompanying illustration is a photograph of a section of a piston of this description.

Start Daylight Saving Now

By Chas. E. Duryea

THE proposition to save daylight by beginning work earlier is one that should be pushed ahead, but it need not wait for concerted action. Almost any factory can adopt it with immediate advantage to its employees. Not only will more daylight work result and more leisure in the evening, but it will lessen the street car congestion so common at morning, noon and night nowadays in the larger cities, when a large number of shops close all at the same hour.

Restaurants that feed such employees, places of amusement of the movie variety and many stores will also appreciate the improvement if even part of the factories adopt the earlier hours.

Mixing Oil with Fuel

In reply to the article by John W. Few, Jr., in THE AUTOMOBILE for Feb. 8, would state that mixing oil with the fuel lubricates and insures tight seating of the inlet valves and also insures ample lubrication of the upper cylinder walls, where they are most likely to become dry. The result is that the engine develops more power and runs quieter. But a pint per gallon of fuel is outrageously expensive, and it would probably clog the engine with carbon in short order. A half pint to 5 gal. is enough for four-cylinder engines.

Must Change Oil Frequently

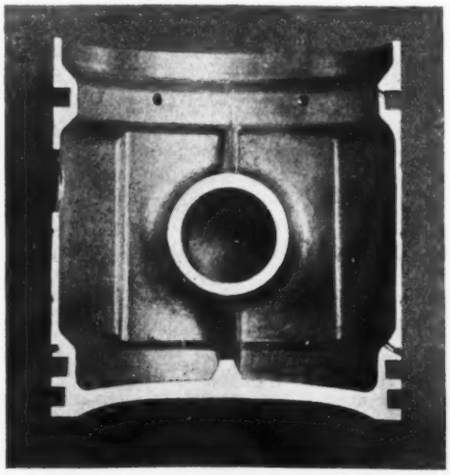
By H. L. Horning

Chief Engineer Waukesha Motor Co.

THE extent to which gasoline mixes with the lubricating oil in the crankcase of an engine in cold winter weather is not realized by many users of such vehicles. So great is the quantity of fuel mixing with the crankcase lubricant that some industrial houses operating large fleets of trucks are having the crankcase oil changed once a week. Careful users of passenger automobiles are having the oil changed each two weeks in the winter season.

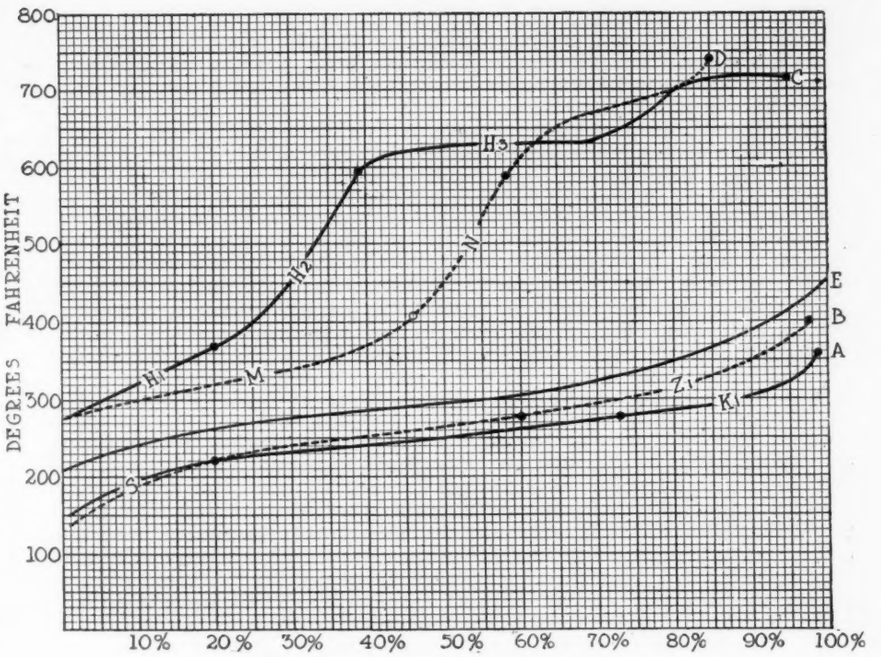
Oil 45 Per Cent Fuel

The exact extent to which gasoline is mixed with oil in the crankcase can be shown by distillation curves and in two recent tests it was shown that 45 per cent of the lubricant in the crankcase of a touring car was a mixture of gasoline and kerosene. The analysis showed that in this particular case only 27 per cent of the actual contents of the crankcase was efficient lubricating oil. The distillation curve of the mixture of oil and fuel in the crankcase of this passenger car is shown by curve D, Fig. 1. This car had run 9 days in the winter without having the crankcase oil changed. An analysis of the curve shows that the first portion marked M represents the percentage of fuel, that is, gasoline or kerosene, which passed off in the distillation process; the percentage being approximately 47. That portion of the curve designated N represents the contents of the crankcase which might be designated as fuel oils used in factories instead of coal. These contents are about fifty-fifty gasoline or kerosene and lubricating oil: they are cracked products and the percentage is approximately 12. That portion of the curve represented by P indicates the percentage of contents of the crankcase which are real lubricating oil, the percentage approximating 77.



Die-Cast aluminum piston for scraper ring

A fuller appreciation of this distillation curve of crankcase contents is shown in the distillation curve B of gasoline used in the engine from which curve D was made. The gasoline in question was approximately 58 Baume, scale, a relatively low grade. Looking at this curve, beginning at the left, distillation started at approximately 180, showing that there were several highly volatile constituents in the fuel, which were good to take up ignition. That part of the curve B marked S is known as the starting zone of the distillation curve. It shows that at 220 deg. Fahr. approximately 20 per cent of the fuel has been distilled. This is a good percentage of distillation of any fuel and makes it relatively easy to start with such fuel. For this reason this part of the curve is known as the starting zone. Looking at the right end of the curve which is known as the end point it shows that this was reached at 404 deg. Fahr., at which time approximately 97½ per cent of the volume had been distilled.



Distillation curves of clean oil, crankcase oil and gasoline

Now to compare the distillation curve B of the gasoline with the distillation curve D of the crankcase contents, in the same motor. Comparison will show that the part M of the curve D which represents the distillation of the gasoline in the oil exactly compares with the part Z1 of the curve B, thus indicating that the curve D is really a continuation of the curve B, with the parts N and Z1 overlapping and the same. It was the same gasoline distilled in curve B which was in the lubricating oil and distilled in the first part of the curve B.

The second analysis was that of the crankcase oil in a truck. In this case 20 per cent of the crankcase oil proved to be gasoline, another 20 per cent showed to be fuel oil which left 55 per cent of the contents satisfactory lubricating oil. The curve C shows the distillation of the crankcase quantities. The first part of the curve marked H1 and representing 20 per cent of the contents was the fuel which distilled first. This portion of the curve compares identically with the end of the curve A indicated at K1. A is the distillation curve of the gasoline used in the engine from which the crankcase contents of curve C were taken. Here again is proof that it was the fuel that leaked past the pistons and entered the crankcase which was distilled off first.

Returning to curve C: That portion H2 represents the heavy cracked part of the fuel and constituted 20 per cent of the crankcase contents. The final part of the curve designated H3 represents the final content of good lubricating oil remaining, which was 55 per cent. As the viscosity increases with the addition of good oil the oil would not work up as fast past the pistons. With the increase of gasoline the temperature of the engine would increase and thus the viscosity drop and the consumption would increase, resulting in the necessity for new oil which when added brings the gasoline percentage down to a lower figure determined by relation of quantity of new oil added to the old mixed oil and its percentage content of gasoline.

In Fig. 1 is shown roughly an additional curve which is that of the California distillate now being extensively used on motor trucks on the Pacific Coast. It will be noted that this distillate starts distilling at 220, whereas the gasoline started at 180 or 200 deg. F. With a distillate there is no starting zone and consequently gasoline has to be used for starting purposes. The curve continues fairly regularly with curves A and B and has an end point approximately the same as that of curve B which was 58 Baume gasoline. It is unfortunate that there is no starting zone and heat has to be applied, but after the engine is warmed up heat reduces the volumetric efficiency and the horsepower is correspondingly cut down. It is conservative to estimate a reduction in horsepower of 10 to 20 per cent because of such use of heat, but economy of fuel is increased considerably.

The conclusions are as follows:

1—The refiners are doing their utmost to supply satisfactory fuel.

2—With our present fuels it is necessary with the average truck to change the oil once a week.

3—With the average pleasure car the lubricating oil should be changed once every 2 weeks.

4—The average tractor should change oil every 2 days.

5—The miles per gallon will be considerably increased by heating the intake gases.

6—By so doing the oil in the crankcase will last much longer without complete change.

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How To Use Gasoline

"GASOLINE and How to Use It" is the title of a handbook by G. A. Burrell, and published by the Oil Statistical Society of Boston, Mass. It is a book that every mechanical owner of an automobile will find interesting and useful, and its 280 pages are packed with data of all sorts. The main theme of the book is dealt with in chapters describing the nature and method of obtaining gasoline. Tests for gasoline and oil are described and there is an excellent portion on the risks in handling gasoline and the precautions that should be taken. There are many pages given to hints for running a car, diagnosing troubles, etc., but these are not quite up to the standard of the rest of the work, being a trifle vague in a good many instances. We notice with surprise that the "clutch" should be in neutral before starting up. However, it is perhaps unfair to criticise so generally excellent a volume for a few slips; the general features are entirely sound.

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British Electrical Equipment

STUDENTS of automobile electricity will find much to interest them in the new edition of Electricity and the Motor Car published by Iliffe and Sons, Ltd., Coventry, England, and obtainable in America from the International News Co., New York. All the principal British magnetos and ignition systems are described and illustrated and all the principal lighting and starting systems. Some attention is given to American ignition and other equipment, including a full account of the Ford ignition.

Glare Problem Analyzed—II

Simple Explanations of Factors Involved Show Better Made Lamps as Main Essential To Its Solution

By Alden McMurtry

EDITOR'S NOTE:—This is the concluding installment of the paper read before the Metropolitan section of the S. A. E. by Mr. McMurtry March 16. The author has studied the subject for years from the viewpoint of the automobilist, the police and the lawmakers, so that his analysis of the situation is both practical and comprehensive.

WHILE defective sockets or socket adjustments are generally the cause of displacement it must not be overlooked that the axis of the filament is not always placed in the axis of the bulb base. Well made lamps have little or no lost motion in the sockets and bulbs as a rule have only a very slight variation in the position of the filament. There are, however, cases too numerous to mention of defective lamp and bulb construction. Some bulbs, especially the Ford type, are either made with the axis of the filament displaced from the base axis, or it becomes so displaced from the effect of vibration, burning over voltage, or both. The result of this displacement is a distorted image which unfortunately has a tendency to raise the beam of light.

Few Lamps Set Correctly

On a foggy night it is particularly noticeable that the headlamps on cars are not properly aimed. Fully 50 per cent of the lamps are projecting the rays of light so that little of the light strikes the roadway. I believe this is due to ignorance rather than to carelessness. I have in mind one car owner who purchased fourteen different types of bulbs in order to improve road illumination when the chief difficulty was that the lamps on his car were so aimed that hardly any of the light fell upon the road. It is only recently that proper attention has been paid to the aiming of the headlamp. In the majority of cases headlamps are aimed so that the front glasses are aligned with the rest of the car simply as a matter of appearance. In a number of cases the brackets supporting the lamps will not permit of any adjustment or alteration, such as Figs. 15, 16, 17 and 18. This often results in inefficient road illumination, and is one of the causes of glare production. It is natural for the owner of the car to assume that the lamps have been set to give maximum efficiency, but this is frequently not the case, although some manufacturers do take pains to see that the light projected is kept below the 42 in. limit. *Had every car manufacturer followed this practice the glare problem would not have arisen.*

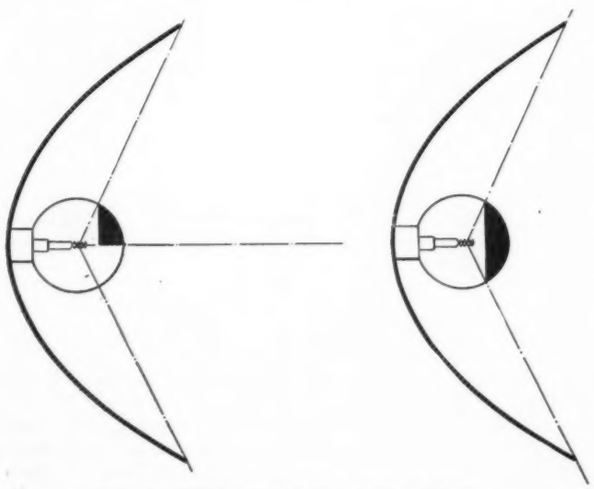


Fig. 11—Effect of painting part of bulb

It must be admitted that, in a majority of cases, the price and appearance govern the selection of headlamps.

Until the public becomes as particular about the design and construction of the headlamps of a car as it is about the type of carbureter or ignition system employed, defective lamps will doubtless continue as standard equipment. This is a matter that can be largely controlled by the motor car buyer if he will insist upon proper construction. The manufacturer of automobile headlamps is only too willing to turn out a lamp of proper design and construction providing, of course, the automobile manufacturer will pay a fair price for it. But as long as the lamp manufacturer is called upon to furnish two headlamps and one tail lamp at a price of less than $3 per set, we really cannot expect a product that will give more than a partial control of the projected light. Headlamps are receiving less attention by engineers than almost any other accessory on the car.

Before considering in general the methods employed in glare reduction we may summarize the details of design that should be given more careful consideration.

Headlamp Requirements

Reflectors should be permanently attached to supports by screws.

Socket Adjusting Devices. At present most socket adjusting devices are faulty and must be made more secure. Bulb and rear adjustment should be discarded.

Sockets must be made to closer tolerances and must be located with their axis in the axis of the reflector.

Bulb. The G-16½ bulb should be discarded. The filament of the G-12 bulb being located near the center of and in the axis of the bulb make it far more satisfactory.

Filament Shape. The coil filament is best for general results.

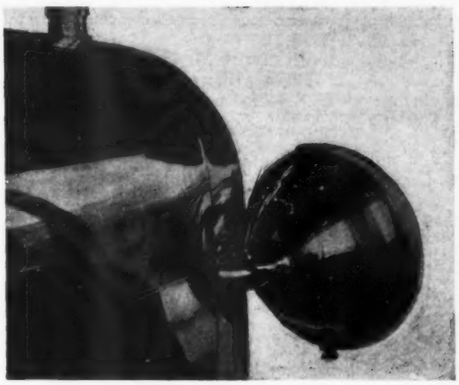
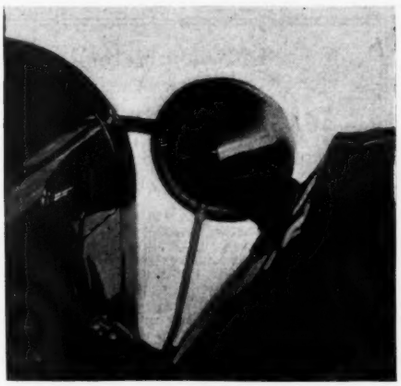
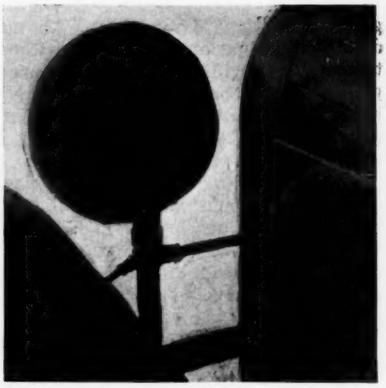
Correct *Aiming of headlamps* is most important.

Filament Area. Only such bulbs as have a filament area complying with the S. A. E. standard should be used.

The problem of the regulation of glare from automobile headlights will never be solved until we determine absolutely upon what basis it is to be attacked. Various laws are based upon entirely different conditions and under these conditions the glare from a headlamp varies. Glare depends not only on the actual candle power and intrinsic brilliancy of the source but also upon the illumination of its environment. This illumination varies from the brilliantly lighted city streets to the dark country roads where the effect of glare will be found at its maximum. I therefore propose that in considering automobile headlamps from the glare standpoint all tests or comparisons be made with the headlamp in an environment of absolute darkness. If this form of test be made standard we have started the simplification by eliminating one confusing variable.

It is regrettable that the numerous methods of conducting tests of devices for reducing glare have resulted in considerable confusion. This is the result of a lack of system in determining the conditions under which the devices are to be tested. Unless some standard form of test is devised we shall continue to read conflicting reports of the same device or method.

I suggest the following methods of test: if the devices are

Figs. 13, 14, 15, 16 showing different ways of mounting lamps so that it is difficult or impossible to set the inclination of the lamps

to be tested out strictly from the motorist's point of view then two cars, equipped with the same device and operated under identically the same conditions of bulb, voltage, candle power, and focal position, should be used. The cars should be made to pass each other on an absolutely dark road at various speeds and the contrast between the road illumination of one car and the glare from the lamps of the other car should be the means of determining the efficiency of the method employed. The speed of the cars is a factor of no little importance. The psychological effects of passing glaring lamps at the rate of 5 and 30 m.p.h. are entirely different.

The confusion incident to the problem of regulating glaring headlights is caused by the attempt to discover a method or means for the absolute elimination of glare without reducing to any appreciable extent the road illumination. This is practically impossible as the ultimate solution of the problem must result in a compromise between the value of the road illumination and the glaring effect produced by the lamps. For instance, if the diffusion method is adopted there cannot be sufficient illumination on the road without causing disastrous glare effects when near the car. If the deflection method is adopted a certain amount of momentary glare due to the position of the car must be permitted in order to gain the advantage of proper road illumination while at the same time (by limiting the height of the beam of light) preventing glare probably over 85 per cent of the time the headlamps are in use. In suggesting any means for glare reduction which may possibly be adopted in future laws, another thing must be remembered: the effectiveness of the law depends upon the manner in which it can be enforced by the average officer. Therefore simplicity of regulations is much to be desired. The simplest method of determining glare reduction will be most effective because of the greater probability of universal enforcement.

Avoid Ambiguity in Laws

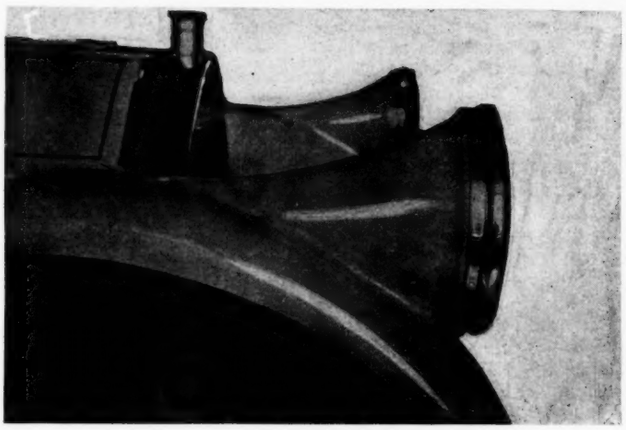
At the same time in seeking simplicity and freedom from highly technical requirements it is unwise to allow regulations to drift into vagueness or ambiguity. The motorist wants to know precisely the limitations of the law. While he has every intention of complying with the law he also wants the best road illumination the law will permit. A source of light of one candle power will cause the effect of glare if of sufficient intrinsic brightness. Therefore the specification "Must not glare or dazzle" is most vague. Until we have a standard unit of glare measurement we must not tolerate such vague requirements.

All devices or methods for glare reduction are based on one of two principles or a combination of both: namely, the reduction of light or the limitation of the light zone.

The methods of *light reduction* may be classified as follows:

(a) Dimming the light.
(b) Change in color of light.
(c) Diffusing the light.

Dimming the light is accomplished by lowering the voltage of the circuit at the bulb, either by means of a rheostat or series connection, which reduces the candle power of the bulb.



This however does not alter the light distribution, so that dimming the light to the extent that at the point of maximum illumination there is no effect of glare makes a light useless for road illumination.

There have been attempts to reduce glare by the change in the color of the light, but I have yet to learn of any real success with this method. Any reduction in glare by this method may be caused by the loss of light due to the absorption by the color screen or glass.

Frosted bulb, frosted front glass, diffusing screens or so-called "lenses" diffuse light and the diffusion of light from a source over a much larger area produces a secondary "source" the intrinsic brilliancy of which is less than that of the primary source. In the case of frosted bulbs, for example, the light from the small area of the filament is diffused over the surface of the bulb. The surface of the diffusing screen should be increased with any increase in the candle power of the bulb. The effectiveness of the diffusion method therefore depends upon the candle power of the light source and the area over which the light is diffused. Any variation in the current passing through the filament of the bulb itself changes the effectiveness of this method.

Fallacy of "Certified Devices"

For example when a Ford engine runs at high speed the generator produces a voltage such as to give a light of the greatest intrinsic brilliancy. A screen which will diffuse this light properly will make the light at ordinary speeds of the engine practically useless as a road illuminant. Facts such as these make it apparent why it is unwise, not to say unsafe, to issue a certificate covering a specific type or make of glare reducing device. For example a screen or so-called "lens" used on a lamp with a 20 candlepower bulb may absorb enough light to reduce the glaring effect sufficiently. But if the owner change to a bulb of higher candlepower (as he is very apt to do when so much light has been absorbed which should be used to illuminate the road) the lamp at once becomes glaring, although the certificate protects the owner from police interference.

With the diffusion method the light distribution on the road

gives a brilliant foreground with no distant illumination. The contrast between this brilliantly lighted foreground and the poorly illuminated background makes night driving at any high, or even moderate, speed dangerous and tiresome to the eyes.

A serious objection to the diffusion method is the fact that any reduction of glare at a distance from the car is added to the effect of glare when near the car. Supporters of this principle have suggested laws, the wording of which is such as to overlook this serious defect. This adds to the confusion regarding non-glare legislation.

Limitation of light zone includes means for:

Cutting off light ordinarily outside of zone where light is required.
Tilting of lamps.
Deflection of lights.
Modified reflectors for bulb or headlamp.

COMPARISON OF THE TWO GLARE REDUCTION SYSTEMS

Diffusion Method

ADVANTAGES

1. Focussing not necessary.
2. Aiming of lamps not important.
3. Sufficient light close to and at sides of car.

DISADVANTAGES

1. Determination as to the amount of glare most difficult.
2. Glare varies with change in voltage.
3. Glare increases when bulb of larger candle power is used.
4. No distant illumination of road.
5. Effect of glare greatest near the car.
6. No warning beam in advance of car.

Deflection Method

ADVANTAGES

1. No expense to tilt lamps.
2. Distant road illumination excellent.
3. No glare whatever near car.
4. Most efficient light distribution on road.
5. Simple method of determining compliance with reasonable ordinance.
6. Temporary changes in voltage or in candle power of bulb do not cause change in glare providing bulb is properly focussed. There is practically no limit to amount of light that can be used safely so long as it is kept below the 42" limit.
7. Warning beam can be seen many feet in advance of car, and helps to reduce contrast between approaching headlamps and roadway.
8. The height of a beam of light can be absolutely determined in the daytime by looking into the lamps from a point ahead of the car and so adjusting them that the reflected light does not strike the ground eye when the latter is more than 42" above the ground.

DISADVANTAGES

1. Exact focussing necessary.
2. Causes momentary glare when car is passing over top of hill, or extremely rough or uneven roads.

Cutting off portions of the light by means of opaque devices or of paint on the bulb, reflector, or front glass may reduce the beam candlepower by 50 per cent or more. This of course is rather poor engineering practice. Furthermore this method is effective only when the bulb is in proper focal adjustment. For example if the upper half of the front glass is painted then the bulb must be focussed to project a diverging beam. Should vibration cause the bulb to move forward sufficiently the beam will become converging, all road illumination will be lost and the unrestricted light directed upward.

Tilting Lamp Simplest and Effective

Without doubt the simplest and cheapest effective method of glare reduction is tilting the headlamps. While the light distribution upon the road is limited in certain respects it is far more effective than any of the previous methods discussed. While it is essential that the bulb be focussed properly the percentage of useful light on the road is very high.

Deflection of the light is accomplished by the use of prismatic glass fronts which tend to redirect all or a part of the reflected light. The re-direction of the light in some devices not only keeps it within the zone where glare is not objectionable but also distributes it over a greater width of road. It is an advantage therefore to use a device of this character *irrespective of the existence of glare regulations.*

Satisfactory results can be obtained by the use of a modified reflector composed of two half paraboloids the axis of the upper one being so inclined as to throw the light toward the ground. In another form the bulb is partly surrounded by a reflector of peculiar form, so arranged as to cut off the direct light and so deflect it that it will be thrown upon the road. Both of these devices are an advantage in that they increase the illumination of the roadway at a point where it is most desirable to have good illumination, and prevent the light from rising above the 42 in. limit when properly applied. Care must be taken however to see that the filament is properly focussed.

Limited Zone Indorsed

The principle of the limitation of light zone has been endorsed by various organizations including the Society of Automobile Engineers. It is the most effective from the motorist's point of view because it reduces glare with the least loss of useful light and in most applications increases the amount of light upon the roadway. It is the method most readily covered by a simple and easily understood ordinance, an ordinance which is not only effective in accomplishing the desired result but with which it is easy to comply and which it is correspondingly easy to enforce. When once properly applied any change of voltage or candlepower of bulb (providing proper focus is maintained) has no effect upon its effectiveness. Bulbs of almost any candlepower may be used without altering in any way the light distribution of glare reduction.

Unlike the diffusion method there is less glaring light near the car, and this is an important item where two cars are passing on a narrow road.

Limiting the light zone will not, however, prevent glare when the car is passing over an uneven road, or over the top of a hill.

Front Light Makes Safety

One of the greatest factors of safety in night driving is the projection of light some distance in front of the car. It acts as a warning to others approaching the highway from intersecting roads of the presence of an automobile coming in another direction.

The projection of light at the side of the road when the automobile is making a turn is a warning to others around the turn that a car is approaching. With the diffusion method this factor of safety is eliminated.

If the percentage of momentary glare from lamps deflected so that the light zone is limited, on a level roadway, to 42 in. from the ground, is too great it may be lessened by limiting the height to 40 or even to 38 in. from the road at a given distance from the car.

Factory Accounting

THE importance of factory accounting systems and their immense power for good or evil upon the balance sheet have only been realized in comparatively modern times. Yet to-day the subject is studied as deeply as are many of the natural sciences. The latest contribution to the literature of the subject, Factory Accounting, by Frank E. Webner, and published by La Salle Extension University, Chicago, Ill., covers the whole subject in considerable detail. From the broadest views of different systems of factory organization, given with a quick and convincing criticism of each, the author goes on to analyze the minutiae of factory accounting, making use of copious illustration. The book forms one of six upon which the course of higher accountancy at the university is based, but it is much more than an advanced student's text. It would be valuable to almost any factory executive, for its instruction to those with a superficial knowledge of cost record and cost control, and for its analyses and comparisons of different systems to the professional accountant. Of course, there will be some who will take issue with the author on some of his beliefs, no doubt, but the volume is so full of suggestions and contains consideration of so wide a range of types of manufacture that it could hardly fail to be useful. It is a book that every factory man who has to follow the detail of costing would do well to have on his shelves.

Hydraulic Transmission

Part III

Importance of This Type of Transmission to the Automobile Industry in the Future as Indicated by Its Development

By F. Leigh Martineau*

IN all transmission gears, for whatever purpose intended, it is desirable that the maximum efficiency possible should be obtained. This is, however, more important on automobiles than on any other machine, as for some purposes it may be convenient to sacrifice some efficiency in order to obtain some other particularly desirable quality in the transmission. With hydraulic transmissions the efficiency as an average has a definite relation to the speed range over which it is desired to operate at full power, and for the following reason. It is only possible to design such a transmission to operate effectively at a certain maximum pressure; at this pressure it will have to exert its maximum torque at the slowest motor speed, and the pump will then have to be working at its minimum effective stroke; at the highest speed the pump will have to run at its maximum stroke, and the motor will exert a lower torque at an increased speed. As the torque at the motor end varies as the pressure, it follows that the pressure will now be the maximum pressure divided by the speed range. To take an example and use round numbers, suppose the maximum pressure possible is 1000 lb. per sq. in., and the speed range required 5 to 1, at the lowest speed the pump will work at one-fifth stroke and 1000 lb. per sq. in. and the motor will give out about 140 in.-lb. torque per cu. in. of capacity. At the highest speed the pressure will be only $1000/5 = 200$ lb. per sq. in., and the motor torque 28 in.-lb. per cu. in. If, however, the speed range desired at full power had been 10 to 1, then the maximum speed would be run at only 100 lb. per sq. in., and the pump at lowest speed would be at one-tenth stroke; in this second instance, the power transmitted is supposed to be the same, it therefore follows that the capacity of the pump and motor would have to be double that required in the former case, and in consequence the average resistance would be greater and the average efficiency lower. By decreasing the speed range the size would be reduced and efficiency increased.

Further Efficiency Curves Desirable

It would have been useful to have had efficiency curves and data of the several types of transmissions mentioned, but unfortunately the time for preparation of this paper has been so short that it has not been possible to obtain them. The author hopes, however, that those who have any authentic information of any of them will provide figures so that they can be inserted in the discussion and increase the value of the paper to the Institution.

Fig. 14 is an efficiency curve of a set of Hele Shaw gear made about 1909, and Fig. 15 one of a similar but slightly larger set made in 1914. Both these have the mechanical efficiency curves of the pump and motor plotted separately, and also the slip curve. The slip curve becomes an increasing quantity as the pressure goes up at constant power, for the volume pumped decreases. The percentage of slip as the pressure goes up at constant pump stroke shows very slight increase.

Little Experimental Work Since 1914

Since 1914 very little experimental work has been possible owing to the conditions existing, but there does not seem to be any doubt but that the efficiency overall can be increased as the knowledge of all details is increased, and the author has no hesitation in saying that very soon after the war has ended it will be possible to produce a transmission which will give an overall efficiency curve of the form given in Fig. 16; this has not been plotted like the others from actual tests, but has been carefully calculated, making due allowance for all factors; it is probably on the low side, and will perhaps be improved on.

The direct drive figures, as obtained in an "all gear" transmission by the National Physical Laboratory test are as follows, and are interesting for comparison; it is a pity that the figures for the lower gears are not also available.

32-HP. LEYLAND GEARBOX

Efficiency of direct drive when gearbox is:

	Per Cent		Per Cent
¼ full of oil	97.5	¾ full of oil	90.0
½ full of oil	94.0	Full of oil	74.0

In thinking of these "all gear" figures, however, it must be borne in mind that they are a fixed ratio, and that intervening ratios are not obtainable, and also that the fact of being able to control the gear ratios as with an hydraulic transmission enables the maximum acceleration to be obtained without any shock such as is experienced with a clutch.

There is no doubt that for heavy tractors and heavy vehicles there is a field for some such transmission, on account of the mass to be accelerated and retarded, but at the moment there does not seem any possibility of making any real progress in

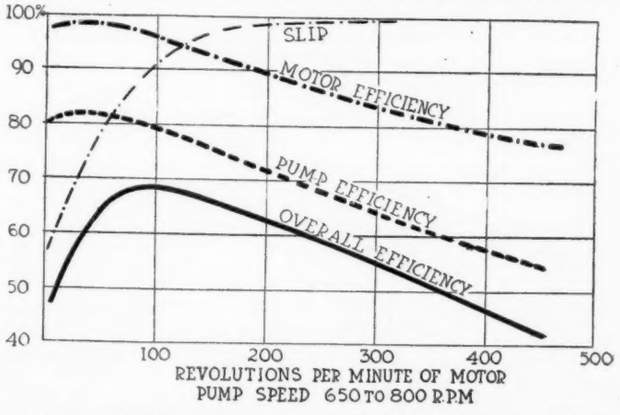


Fig. 14—Efficiency curve of a set of Hele Shaw gears made about 1909. Compare with Fig. 15

*Paper read before the British Institution of Automobile Engineers. Martineau has been well known among the members of the institution for many years. Designer of the British Pilgrim car, he later joined with Dr. Hele Shaw in developing the Hele Shaw-Martineau hydraulic-electric steering gear for ships. He also did much work on automobile hydraulic transmissions, and members of the S. A. E. party who visited England in 1911 may remember that a party traveled to one of the factories near London on a truck with this gear.

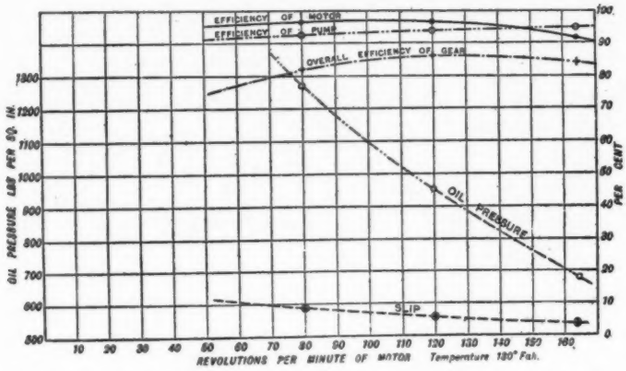


Fig. 15—Efficiency curve of a set of Hele Shaw gears made in 1914. These are similar to the set in Fig. 14 but slightly larger

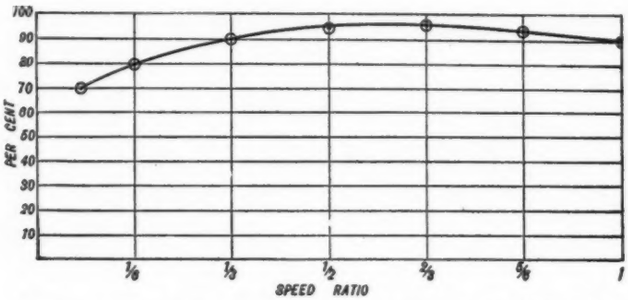


Fig. 16—Overall efficiency curve of a transmission which the author predicts it will be possible to produce soon after the close of the war

this direction. It is to be hoped that after the war conditions will exist which will enable the matter to be pursued further. It has often been urged upon the author that a hydraulic transmission must weigh more than a gear transmission, must cost more and be more complicated.

This, however, does not appear to be correct. On the question of weight it must be remembered that as a rule the flywheel, clutch, gearbox and countershaft brake can be totally eliminated from the chassis, and replaced by two units in one case, which is mostly revolving weight, and will perform all the functions of the parts mentioned with the added advantages of being able to make use of the whole of the engine power *all* the time during acceleration, using all the engine power at its most efficient speed on inclines, and having at command an absolutely steady retarding effect which converts surplus energy into heat without causing wear. By using high quality materials and good design the weight of such a transmission can be the same as its equivalent gearbox, etc.

As regards cost, a greater difficulty exists in getting a true comparison, for in the case of gearboxes quantity production is generally employed, with the help of specialized machines for the output of such parts. Hydraulic transmission has no such advantages, as quantities have not been built, but it can be inferred that as weights are approximately equal, and the number of *unlike* parts required by the hydraulic transmission is considerably less than the gearbox, and that practically cylindrical parts alone have to be produced, the cost should, if anything, be in favor of the hydraulic gearbox.

Complication from Two Viewpoints

The question of complication must be considered from two points of view—that of the manufacturer and that of the user. The manufacturer will have fewer unlike parts to produce, but will have to make more like parts per car; this would seem to indicate simplicity and not complication from his point of view.

The user has less to look after and no adjustments or adjustable parts to look after, but he has to keep the case full of oil to a certain mark, and that is all; this does not appear to show complication from his point of view.

The author has driven many thousands of miles on experimental vehicles with this transmission, and with all kinds of loads and in all weathers, and can certainly say that he has never driven a car so kind or so easy to control. Like all experimental work performed in little known regions, mishaps have occurred and disadvantages have been discovered, but all so far have proved amenable to reason and experience.

Hall Transmission

In Fig. 17 the pump crankshaft *A* is driven by the prime mover, and operates the pistons *B* in their cylinders *C*, three in number. The pump cylinders are made in one piece with the motor cylinders *D*, with the necessary distribution valves between them (not shown); this whole block is arranged on bearings so as to be capable of rotating on the same axis as the crankshaft, and it carries the chain wheel used for driving the vehicle. The motor cylinders *D* are four times the volume of the pump cylinders, and have pistons *E* operating by means of connecting-rods *F* on a crank *G*, fixed as regards rotation, but variable as to eccentricity in relation to the axis of the shaft *A*. This variation of eccentricity is brought about by having a fixed shaft *H* with an eccentric hole in it, carrying a shaft *J*, capable of being rotated half a turn, and having the eccentric end *G* on which the connecting-rods *F* work. When the end *G* of the shaft *J* is in such a position that its center is coincident with the axis of the shaft *A*, the motor pistons make no motion in their cylinders, and the liquid from the pump cylinders, having no outlet, causes the whole cylinder block to be driven round solid at the same speed as the shaft *A*.

As the shaft *J* is rotated to give eccentricity to its end *G* in relation to the axis of the shaft *H*, so that the motor pistons operate through an increasing stroke until after the shaft *J* has been rotated half a turn; the motor pistons then have their maximum movement, and the lowest gear ratio is produced. The shaft *J* is rotated by a worm and worm wheel.

Janney Transmission

The pump, Fig. 18, has a shaft 1 carried in a bearing 2 near its outer end and forming part of the pump casing. At its inner end the shaft runs in a bearing 3 in the midplate 4, which in this type acts as a distributing valve and thrust plate.

On this shaft near its inner end the cylinder block 5 is mounted; this is arranged on keys so that it can move endways on the shaft but must turn with it.

Between the cylinder block and the outer bearing is mounted on the shaft a universal joint 6, coupled also to a ring 7 into which are fitted the ball ends of the connecting-rods 9. This

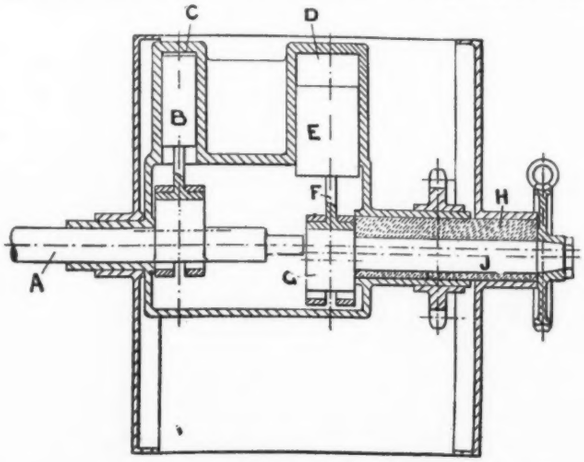


Fig. 17—Hall transmission, showing principle of operation

joint-carrying ring 7 is supported in a frame 8 capable of being tilted on two gudgeon pins at an angle to the plane normal to the axis.

The connecting-rods 9 at their small ends also are of ball form and fit in pistons within the cylinders.

The cylinders are parallel to the axis of rotation and have the ports where communication is made with the midplate of such proportions that the resultant hydraulic thrust in the direction of the axis is practically zero, so that the cylinder block can be kept up to its valve with a constant known pressure by means of a spring.

To correct the irregular angular motion due to the universal joint 6 through which the torque is transmitted, the cylinders are spaced at unequal intervals, and in this manner uniform angular velocity is obtained at the shaft. Discharge volume variation is produced by varying the angle of the frame 8, zero discharge being obtained when this is perpendicular to the axis.

The hydraulic motor used with this pump is a similar machine with the frame 8 fixed at an angle. Usually the same midplate is arranged to carry both the pump and motor as one unit, one at each end, but obviously they can be separated.

Hele Shaw Pump

Figs. 19 and 20 show diagrammatically a section through the center of the pump at right angles to its axis. The cylinder body *C*, in which are formed a number of radial cylinders, is driven by the prime mover and fits on a fixed central distributer *D* in which are the suction and delivery ports. In the cylinders are pistons *H* having gudgeon pins *G* on which are fitted slippers *J*. These fit in an annular groove and so are forced to follow a circular path *E*. The position of the center of this path can be changed by moving it along the line *AB*.

If the cylinders are rotated as shown by the arrows, there is no radial motion on the pistons and therefore no delivery when the center of the path coincides with the axis of the cylinders as in Fig. 19.

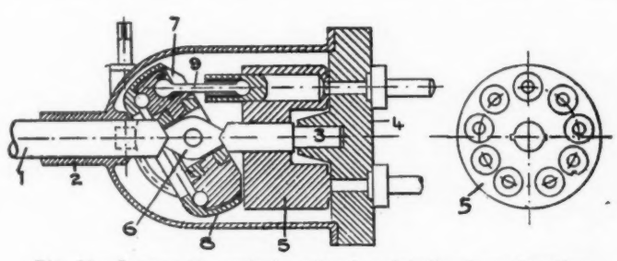
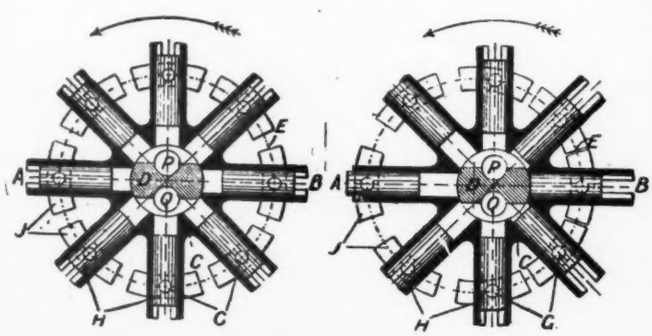
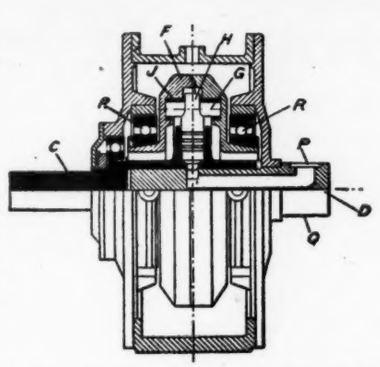
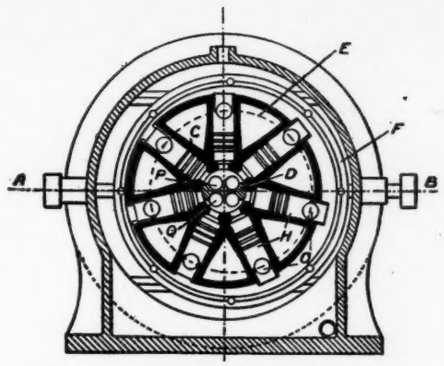


Fig. 18—Janney transmission showing details of construction



Figs. 19 and 20—Diagrammatical section through the center of the Hele Shaw pump at right angles to its axis





Figs. 21 and 22—Hele Shaw pump detail. Illustrating the method of decreasing the resistance of the slippers J by forming the path E as part of a floating ring mounted on bearings

By moving the path to one or other side of the axis the flow of liquid is caused to take place in one direction or the other through the pump. The greater the eccentricity given to path *E* the greater the volume delivered by the pump. With this construction the slippers *J* would traverse the whole surface of the path *E* once per revolution, and their resistance would be high.

To decrease this resistance the path *E* is formed as part of a floating ring mounted on bearings. Figs. 21 and 22 show this in outline, the lettering used denoting the same parts as in Figs. 19 and 20. The action of the pump is similar except that the slippers in moving drag the floating ring *F* around with them on the bearings *R*, thus reducing friction as the slippers only have a small motion relatively to each other once per revolution.

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Small Field in Danish West Indies

OPPORTUNITIES for marketing automobiles and motor trucks in our new possessions, the Danish West Indies, are not very large, according to a special bulletin published by the Bureau of Foreign and Domestic Commerce. St. Croix seems to be the most likely field among the islands, as it has about 100 miles of good roads. Twenty-two automobiles are registered on this island, nearly all of which are for hire, the standard charge being 20 cents per mile. The Bethlehem factory has a motor truck to cart its sugar to port, and there may be a field for several more trucks here, although there are only two or three concerns whose business is large enough to warrant such investment. The common means of transportation for sugar cane and other products are mule teams, ox carts, horses and industrial railroads owned by the factories.

In St. Thomas there are about 15 miles of good roads and one automobile which is for hire. On St. John the only means of transportation is by horseback, as the country is very steep and hilly and the roads are poor.

The rule of the road is for all vehicles to keep to the left, except when passing another by overtaking it.

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Mirro-Like a New Body Polish

A NEW body polish is made by the Mirro-Like Mfg. Co., 203 Eighth Street, Long Island City, N. Y., under the name Mirro-like. This is not sprayed on the car, but is applied with cheesecloth, the manufacturer claiming that it imparts a brilliant, lasting, hard finish to the car body and leather upholstery without leaving any oily residue. The compounding of various elements which have been used for years by piano manufacturers in refinishing piano cases insures finish-restoring qualities for the polish, which is sold in half pint cans as samples and in pint, quart and gallon cans for regular use. Price $1 per quart and $3 per gallon.

Automobile Calendar

CONTESTS

1917

April—Los Angeles to Salt Lake City Road Race.
May 10—Uniontown, Pa., Speedway Race.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
May 30—Uniontown, Pa., Speedway Race.
June 9—Chicago, Ill., Speedway Race, Championship.
June 23 — Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 4—Uniontown, Pa., Speedway Race.
July 4—Tacoma, Wash., Speedway Race, Championship.
July 14 — Des Moines, Iowa, Speedway Race, Championship.
Aug. 4—Kansas City Speedway Race.
Aug. 18—Elgin, Ill., Road Race.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
Sept. 15 — Providence, R. I., Speedway Race, Championship.
Sept. 29—New York Speedway Race, Championship.
Sept. 30—Uniontown, Pa., Speedway Race.
Oct. 6—Kansas City Speedway Race.
Oct. 6—Uniontown, Pa., Speedway Race.
Oct. 13 — Chicago Speedway Race.
Oct. 27—New York Speedway Race.

SHOWS

March 17-24 — Pittsburgh, Pa., Motor Square Garden. J. J. Bell, Mgr. Automobile Dealers' Assn. of Pittsburgh.
March 18-23 — Cedar Rapids, Iowa, Cedar Rapids Automobile Trades Assn.
March 20-25 — Denver, Col., Mammoth Rink. H. F. Blackwell, Promoter.
March 21 - 24 — Danville, Ill., Show, Sanford Building.
March 22-24 — Mankato, Minn., Show, Mankato Retail Auto Dealers' Assn.
March 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show. J. E. Nelson, Mgr.
March 31 - April 14 — Atlantic City, Garden Pier. S. W. Megill, Mgr.
April—Milwaukee, Wis., Spring Show, Milwaukee Automobile Dealers.
April 3-7—San Francisco, Commercial Car Show, Exposition Auditorium. I. R. Gates, Mgr.
April 4-7—Stockton, Cal., Second Annual, San Joaquin Auto Trades Assn. Samuel S. Cohn, Mgr.
April 11-14 — Calumet, Mich., Show, Upper Peninsula Show Assn.
April 20-26 — Milwaukee, Wis., Used Car Show, Milwaukee Automobile Dealers, Auditorium.
Sept. 2-9—Spokane, Wash., Interstate Fair.
Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.
Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.

S. A. E. Calendar

Standards Division Meetings

APRIL

11—Lighting, Cleveland, at National Electric Lamp Works.

Section Meetings

MARCH

30—Indiana, Claypool Hotel. Papers by F. Jehle, Mr. Nelson of Premier Co., Albert Champion and F. E. Moskovics.

APRIL

14—Mid-West — Devoted to a symposium on carburetion with talks by F. C. Mock of Stromberg Motor Devices Co. and H. L. Horning of Waukesha Motor Co., and a written communication from Dr. Burton, vice-pres. Standard Oil Co.
19—Metropolitan, Driving the Car Magnetically, a paper on the Owen system by W. Goll. A paper on the Woods system by W. Kennedy.
20—Cleveland—Hollenden Hotel. Automobile Engine Cooling, A. K. Schanze of Pitter Fan Co.
30—Detroit — Annual business meeting.

MAY

17—Metropolitan, Engines that Will Burn the Fuels We Shall Have to Use. Papers by H. G. Chatain on the Diesel and P. O. Scott on the Junker.

Engineering Calendar

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automobile Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architects and Marine Engineers.

APRIL

7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
12—Illum. Eng. Soc. New York section. Projectors, C. A. B. Halvorson, a paper on industrial appliances.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
19—Mining & Met. Soc. of Amer. monthly meeting New York section at Engrs. Club.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

MAY

5—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Soc. for Elec. Development annual meeting.
12—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
14—Amer. Soc. Heat & Vent Engrs. monthly meeting Mich section at Detroit.
15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
17—Mining & Met. Soc. of Amer. monthly meeting New York section at Engrs. Club.
18—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
19—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
21—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21-24—Amer. Soc. Mech. Engrs. Spring meeting in Cincinnati. Joint session May 22 with Nat. Mach. Tool Bldrs. Assn.
29—June 1 — Nat. Elec. Light Assn. Convention at Atlantic City.

JUNE

2—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
5-7—Nat. Gas Engine Assn. annual meeting at Chicago (Sherman House).
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
9—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
13-14-15 — Amer. Ry. Master Mech. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqrts. Marlborough-Blenheim Hotel.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
15—Illum. Eng. Soc. Pittsburgh section, Office Building, Lighting and Inspection Trip through City and County Building. Mr. S. G. Hibben.
16—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
18-19-20 — Master Car Bldrs. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqrts. Marlborough-Blenheim Hotel.
21—Mining & Met. Soc. of Amer. New York section monthly meeting at Engrs. Club.
26-30—Amer. Soc. for Test. Mat. annual meeting Atlantic City.

JULY

7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

AUGUST

4—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
11—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
13—Amer. Soc. Heat & Vent. Engrs. monthly meeting Ill. section at Chicago.
13—Amer. Soc. Heat & Vent. Engrs. monthly meeting Mich. section at Detroit.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
20—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

SEPTEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
10-14—Assn. Iron & Steel Elec. Engrs. annual convention at Phila.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
13—Amer. Soc. Heat & Vent. Engrs. monthly meeting Penna. section at Phila.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
20—Mining & Met. Soc. of Amer. monthly meeting N. Y. section at Engrs. Club.
24—Amer. Inst. Metals at Boston.
24—Amer. Fdry. Assn. annual meeting at Boston.